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SECTION: MODERN INFORMATION TECHNOLOGIES

ANDROID L – IS A NEW VERSION OF ANDROID OS
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Android L is a new version of the mobile operating system Android. It was presented to the public on June 25, 2014. Android L represents a new step in the development of mobile operating systems. The objective of my thesis is to tell about the new features of the mobile operating system Android L.

The main differences between Android L and previous versions:

1. New design.

The main announcements I / O 2014 is new Android and Web services Google "design language", which is the largest rethinking appearance of the operating system since the release of Android 4.0 "Ice Cream Sandwich" in 2011. Google described Material Design as an attempt to present application interface as if made of paper, but at the same time able to take on different values in height.

2. Not only for smartphones and tablets.

Android L is developed in Google as a system designed not only for smartphones or tablet PCs. The company plans to capture other market sectors, including wearable devices, cars and TVs.

3. Simplified security.

Google continues to improve the security of Android that aspect of the system for which developers are the most criticized. Smartphones with the new operating system, for example, will be able to distinguish between the situations in which they are required to enter a password to unlock it, and in which you can do it without the password. The password is not necessary to be entered if the smartphone "feels" a number of "smart" watches with Android Wear associated with it, i.e. it is likely that the owner holds the device. One can also specify a "safe" location where the password is not required.

4. Project Volta: caring for the battery.

Google decided to develop a number of improvements related to power supply named Project Volta. In Android L normal mode preserving battery life appears. One of the functions will allow the developers to control the energy loss by its applications; the other one will permit energy use optimization.

5. Ubiquitous notice.

In Android L user notification system is significantly redesigned. Earlier everything smartphone wants to tell you, except the caller interface alarm and incoming calls, was accumulated in notification bar. Now all messages, social networks "likes" etc. will appear on the smartphone or tablet's screen. The system will analyze the user's behavior in order to display the most important events on the screen.

6. "Engine" replacement – ART instead of Dalvik.

In Android L the new runtime application – ART (Android RunTime) will be used by default replacing the existing from the very first version of OS environment Dalvik. Its advantage is that all the instructions for the application will be compiled when you run it, as it was before, but during its installation. It will allow Android-devices to fulfil applications code much faster.

7. Tabs Chrome "moved".

In Android L the way users interact with sites open in a mobile version of the Chrome browser will be changed. They will be available through the main multitasking system menu. The same opportunity will be opened for the third-party applications while the Chrome itself will be designed in the style of the new Material Design. Changes have taken place "under the hood": now the browser immediately reacts to pressing and displays smooth animation the frequency of 60 frames per second.

8. "Chromebook" is the best friend.

Apart from the fact that new uniform design of Google will gradually penetrate into Chrome OS, "laptops browsers" with desktop OS from the largest search engine will come closer to the Android-smartphones and in other aspects. For example, "Chromebook" will be able to log into your account without a password automatically if it "feels" "familiar" smartphone nearby.

9. For business users.

Corporate customers prefer proven to be more secure iOS to Android-devices. Google wants to change this attitude, built into Android L series of features borrowed from the Samsung Knox system. The purpose of the innovations is to permit to separate corporate and personal data on the device without problems. It will be called "Android at work". Besides Samsung the system will be supported by HTC, Sony, LG and Motorola devices. Google Docs in Android L applications will be able to edit Microsoft Office documents directly and that will attract corporate customers' attention.

10. You can try today.

Owners of smartphones Nexus 5 and tablets Nexus 7 will be able to download pre-test version of Android L for their devices in the form of system images just today. The final version of Android L will be available for the customers by the end of 2014.

Android L provides new and expands existing capabilities of the operating system for mobile phones and tablets. The development of mobile operating systems is increasingly developing now, and now there are attempts to create a universal operating system.

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THE FEATURES OF COMPUTER ANIMATION CREATION AND SELECTION

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Nowadays, computer technologies and the Internet increase the degree of the electronic media usage. Modern technologies offer the potential for not only printed products, but also multimedia publications.

The literature review showed that one of the promising areas of multimedia technologies is the computer animation creation − sequential slide show of pre-prepared graphic files, and computer motion simulation by changing the shapes of objects or displaying sequential images of movement phases, prepared in advance or created

during the animation. The object of the study is the process of creating computer animation with subsequent placement on the Internet.

On the basis of the analysis of modern forms of computer animation their classification by the type of graphics, software technologies applied, methods of creation and implementation is carried out (Figure 1).
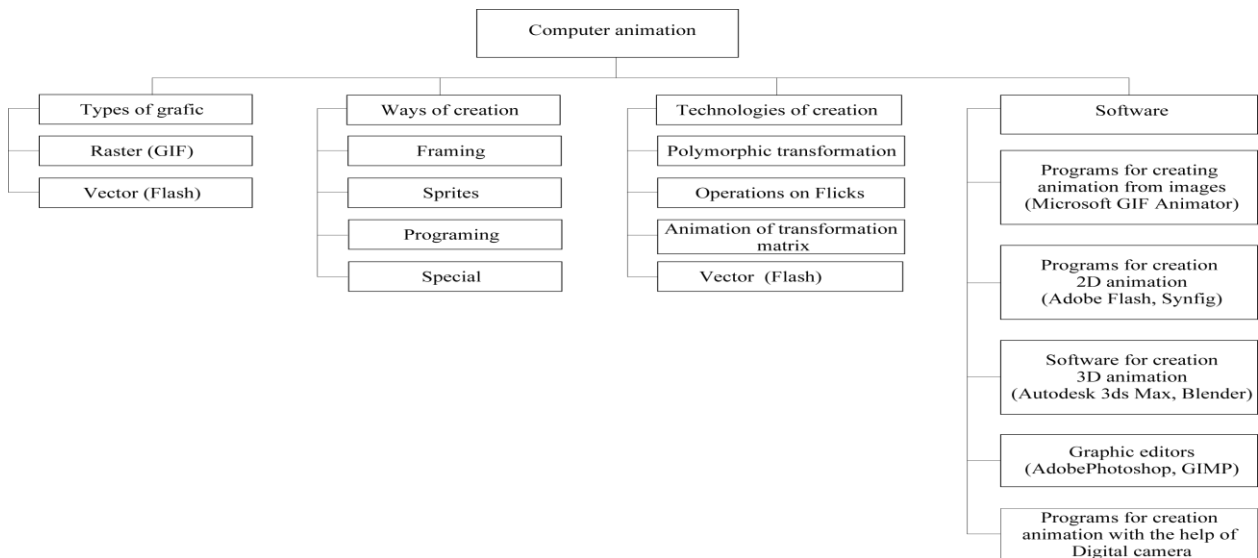
Figure 1 − The Classification of Computer Animation

It was ascertained that the main task is to choose Animations of between types Gif and Flash. Animated Gif type appeared much earlier than Flash technology and is a sequence of bitmap frames that replace each other. The change of frames happens consistently and based on a programmed delay of each frame. This type of animation is usually used in complex scenarios. Smooth motion in such a banner can be achieved only through many intermediate frames, which significantly affects the volume of the file and is the main defect of Gif animation.

The advantage of this type of animation is economic feasibility. For example, the value of creating Gif animation is twice less than Flash. Therefore, it is more reasonable to use Gif-animation in the case of simple scenarios. It should be noted that search engines index better such animation, sometimes they can be found in the section of images to search engines. Another advantage is the availability to the user. As the speed of access to the Internet is well developed it is hard to find a user with disabled graphics in his browser, but some users with disabled Flash Player still occur.

The appearance of the Flash technology opened up for designers tremendous opportunities for creativity. Flash Animation type can include both bitmap and vector graphics. Flash-animation has significantly smaller size of file compared with other species, which makes it possible to use much more complex scenario. The animation is visually smooth. The effects have much more impressive look. In addition to a huge number of advantages Flash-animation has a minus. The cost of production is much higher than of Gif-animation.

Thus, on the basis of the analysis we can conclude that the development of computer animation technology opens up the prospects of creating games, animations and websites due to interactivity, usability and aesthetic appearance improvements. It was ascertained that the programmable animation provides the greatest opportunity by method of

implementation, – polymorphic transformations – by creation technology. The choice of software is due to the specific type of animation.

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NEUROMORPHIC ENGINEERING
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First of all, it's worth to say about neuromorphic (NM) engineering as a meaning. NM engineering (NME) is an idea that appears in the 80s years of 20th century and which illustrating the use of VLSI systems (VLSIS) holding analog circuitry to simulate biological neural architecture that situated in the human being nervous system. Currently meaning NM been used to describe three types of VLSIS: analog, digital, and mixed-mode of previous two modes and models of human neural systems that are implemented in software systems. A main idea of NME is to figure out how the morphology of nervous system at all and parts of it produced aspirational computations, affects how Info is standing for, influences robustness to harm, complex explores and development, adapting to local change, and opportunities for evolutionary changes.

There were some attempts to make that system. Such examples could be:

1). Three years ago, a MIT researchers team built computer chip which simulates the analog, ion-based connections between two neurons in one synapse with default CMOS production technology and nearly 400 transistors.

2). Spin transport electronics Researchers two years before demonstrated at Purdue a paper on design for a NM chip with side spin flaps and memory resistors. They convince that the architecture that they have designed working like neurons and can be used to analysis different methods of representing a processing ability of human brain. Moreover, they have better power efficient than conventional chips.

3). Also there was the research at HP Labs where memory resistors have shown that while they can be non-volatile, the volatile behavior exhibited at temperatures significantly below the phase transition temperature can be exploited to fabricate a neuro resistor.

Today it should to be said about Qualcomm experience in NME. They had demonstration of it at their head-office and it looks frugal, but it is a look into the new era of computer technologies.

The robot is carries out tasks that are generally require powerful, expressly programmed technology that use far more electric power. Works only on a smartphone chip with special software, Pioneer can identify thing it has not seen before, sort them according to the similarity with related things, and move around the room to take them in the right place − not because of the tedious programming. The robot may do whatever of that because of its imitation, albeit in a very limited extent, the way the brain functions.

Next year, Qualcomm would begin to reveal how the technology can be embed into the silicon chips that power all styles of electronic apparatus. These "NM" chips − called so

because they was modeled on real human brains − will be intended to processing the touch Info and to respond changes in those data in methods not concretely programmed. They promise to speed up the decades of choppy progress in artificial intelligence and conduct to technology what is able to understand and engage with the world through humanoid methods. Medical equipment could monitor individuals' essential signs and response to treatments for a long time, studying to regulate doses or even catch problems earlier than modern medical apparatus. Your mobile phone could learn to foresee what you will need next, such as change of background by Info about your emotional state, play music about which you are thinking, to make for note about meeting about which you are speaking now, to type text about which you think and many others interesting things. Example of such technology could be self-driving cars made by Google, what is experimenting with might not need to take part in it for you.

So as we see NME could be used in different spheres of our ordinary living. This technology could help us with health by new medic equipment, with fun by new electronic devices and it could be the main part of future ideas of "smart house".

As a conclusion, it should be said, that there are many different ideas and projects in the sphere of NME and, to my mind, that big part of them will be useful in casual life of ordinary people and we are looking forward to using Qualcomm technology, because this technology could be a big step in future of NM systems. And all what in need from us it's to help if we can or simply keep calm and trust in researchers, trust and wait.

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VIRTUAL REALITY HEADSET
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Everyone has heard mention about glasses of virtual reality. Why would you buy a head-mounted display? What are the main features of a head-mounted display? Let's find the answers to these questions.

Virtual reality (VR), is sometimes called spectacular media computing simulation ambient which can simulate the physical presence in areas in the physical world or of image worlds. virtual reality could create a sensor experience, including virtual flavor sight, smell, hearing, touch. The Rift forthcoming a virtual reality head-mounted display. While it is as independent company, Oculus virtual reality raised $ 2.4 million to develop customized versions of Rift. Product expected to become in stock in Apr. 2015. Oculus Rift a new virtual reality helmet specially designed for playing video games which will change your view of the game forever. Since incredible wide field of vision, high-resolution screen, and the ultra-low delays of the head monitor, Rift provides a truly new experience that lets you enjoy your favorite games, better than ever before. The Rift takes 3D gaming to the next level.Rift takes a 3D gaming to the next level. There are a large number of headsets VR, but none of them do not provide a truly exciting gameplay experience. Majority of products or

lacks the technical capabilities needed for believable dipping or have a very high price ($ 25000), designed for military or scientific community. Several weeks ago Oculus VR presented the Oculus Rift Development Kit 2 (Dk2). Second set of development has a lot technological breakouts of the key elements and fundamental consumer Rift including the low insistence high definition display and accurate, low delay positioning monitor head. DK2 does not match with the consumerist Rift, but the main part of the building for a full VR present. All the content designed using DK2 would work with the consumer Rift. And whereas the a common experience continue requires improvement before it is the consumer ready. DK2 use lowest persistency OLED monitor remove blurriness and jitter, two of the biggest investors in simulator sickness. Lowest stability and the makes the scene appearing visually more stable and enhancing thecapacity to presence. High definition 960 × 1080 TV eyes monitor decreases thescreen a door effect and enhances clarity, color and contrast. Accurate positional monitor is another key demanding for comfortable virtual reality; without it, a lot of your real worldwide movement is lost. One month ago, Samsung introduced the head-mounted monitor, developed in collaboration with Oculus VR called Samsung gear VR. Samsung Galaxy Note 4 is used as screen and a computer mechanism VR. Like Google cardboard accessory VR has no display itself. The mechanism of VR Samsung, can actually be thing that helps it going mainstream, considering that you do not need a PC to start it, you do not need for accession by cable to the side of head and you can run many of the most of main experience VR, will never needing to stop using it.

Nevertheless one more company going to do their market entry VR and is a French company ARCHOS. In Archos VR Glasses cheaper way to transform nearly any phone in the virtual reality. For sale in November, the cost of Archos VR glasses for only £ 25; Smartphone not included, of course. The headset is consists of a thickset sun visor that the belts on your head, with a cut at the front for you to slide your cellphone in place. After that, phone plays the video and gaming, creating an effect placement you in the scene before your eyes. Archos says the system supports more than 100 a virtual reality apps moving you in the action.

Virtual reality will continue dynamic development in the nearest years. Oculus Rift offers many advantages compared with rivals like the low latency, Head tracking, ultra-wide field of vision. Oculus Rift ensures high class a virtual reality experiences at affordable price. Rift is also designed to be as possible comfortable and easy as possible for extended game sessions. For most people, a VR helmet remains a luxury, but I hope that Oculus fix it soon, and everyone can afford to buy them for the normal price and enjoy all the advantages of VR. At the moment Oculus Rift is still under development, I would recommend to wait the release the consumer version.

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SMARTPHONE AS A MOBILE PAYMENT SYSTEM

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Nowadays smartphones are almost always placed in our hands. But this situation quickly changes when you want to buy something at the shop and you must to use your cradit card. The concept of a phone that can be used as your wallet for payment operations which may be realized by scanning, swiping or tapping, that will allow us to pay at the payment terminal − is a long-promised future that unfortunately has been suprisingly not so fast in coming. Bunch of mobile payment technologies already exist, but there is no winning solution and there is a chaos in methods of implementation.

A smartphone wallet application gives us a better method to manage payment cards such as debit and credit cards or even loyalty or discount vouchers. The smartphone wallet application also offers us a better way to control our finances, in a way that your phone will be a single place to analyze and examine your spendings. Using your smartphone as a payment system can make the checkout process much more faster. You can simply tap your smartphone on a payment terminal, instead of rifling through your wallet with a chance that you forgot your card at all. After autorithation of transaction by tapping your mobile wallet application also can simultaneously apply loyalty or discount points.

Electronic commerce company Amazon already offers a payment system that allows you to check out at online stores. An online payment giant PayPal also has a new payment options, which was released in form of applications for Android, iOS and Windows Phone and lets you to store loyalty cards. But surprisngly the company that achieved the most success at implementation of a popular and usable mobile payment system is Starbucks. Their mobile application lets users to pay for orders with smartphones at the Starbucks coffeehouses and also rewards customers with free food or drinks.

All those solutions that implemented by so many companies still looks like a chaotic playfield, and examples above are just dust on a surface. The main reason why so many different applications and mobile wallets represented on the market is that the previous attempts of realisation tap-to-pay or contactless payments take strangely long time to get moving. But nowadays there is very interesting changes in those kind of technology too. The greatest trouble is that there is too many standards that have not yet been worked out well.

N.F.C. is a technology that provides contactless payments and stands for near-field communication. Something like short-range radio. You tap or wave your phone in front of contactless terminal when you pay for something and after entering PIN you're done. N.F.C. chip obligatory in your phone for this kind of operation. New Androids and some

Windows Phones have N.F.C. and for iPhones it means iPhone 6 and iPhone 6 Plus. MasterCard and Visa have approved usage of their cards with technology called H.C.E., that is basically the Google Wallet application that has permission to act exactly like your credit card. Potentially many applications will soon be able to let you implement contactless payment operations like Google Wallet or Isis doing it now.

One another hand contactless payments can't happen without payment terminals in stores that can read the signals from N.F.C. chips. Unfortunately, not every store has those terminals or wants to install them.

But mobile payments look like they will be coming. Most Western credit card companies are migrating from cards that use a magnetic stripes to those that use microchips, which work with contactless payment terminals, so the credit card migration could also help out N.F.C.-based mobile payment methods. Thereby these companies use cards with microchips instead of those ones with magnetic stripes to store information.

Finally, there is still a lot yet to be solved before mobile payments become as popular as credit cards, but the new options popping up are amazing, and once you get the hang of them, they can actually make paying a little easier.

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WHY FUNCTIONAL PROGRAMMING PARADIGM SHOULD BE TAUGHT BEFORE IMPERATIVE PROGRAMMING

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This paper is an attempt to demonstrate advantages of functional paradigm over imperative as the first programming technique to be taught.

Functional programming is called like that because its fundamental operation is the application of functions to arguments, which may be functions too. The special characteristics and advantages of functional programming are often summed up as follows. Functional programs contain no assignment statements, no variables, only values, which once assigned with a value, never change. It means that functional programs have no side-effects, which makes functional paradigm attractive for creating rock solid computer applications. In turn, imperative programming relies on a change of state of a variable, so such programs have undesirable side-effects that are difficult to fix.

Functional paradigm maps perfectly on mathematics theory, which does not have mutations, so students with calculus background already have minimal basis for studying functional paradigm. But imperative paradigm implies not intuitive mutational operations, which often confuse students. For example, expression $a = a + 1$ doesn't make any sense from mathematical point of view, but it is acceptable and used in imperative programming.

Also, functional paradigm supports the move from a language-centric to a concept-centric teaching style, where the programming language is only a tool that allows the lecturer to demonstrate the fundamental principles of computing. It contradicts imperative approach to teaching programming, where the various syntactic forms and features of a programming language guide the development.

At least one imperative programming language is known to the majority of students who start to learn programming, but others don't have any thought about programming at

all. So, the latter lose their motivation when they face trivial syntax problems, while other students are far ahead of them. On the other hand, well-prepared students do not pay attention to lectures or even skip them because of lack of interest to already known topics. These difficulties can be reduced by teaching functional languages at first. So functional languages act as equalizers between students who bring existing programming experience into the course and those who do not.

Furthermore, the succinct syntax and high-level of articulateness of a functional language allows to develop complicated example programs interactively on the lecture. A teacher can easily hook up his laptop to a data projector and actually develop programs in class. According to the research of Manuel M. T. Chakravarty and Gabriele Keller [1], it was very helpful and 60% of respondents gave positive feedback for this kind of interaction.

Functional programming paradigm is becoming more and more popular with development of parallel and distributed systems, so it can serve not only theoretical purpose, but practical too. Also it can be tied up with calculus and other mathematical courses as continuation, which develops learned concepts and depicts them in real use. Finally, functional programming as the paramount paradigm in education can serve as equalizer between students with different programming backgrounds.

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MULTI-CORE DEFINITION
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It's been almost ten years since the first dual-core desktop CPUs appeared on the marked, and since that time, multi-core architecture and processor parallelization has become the preferred refuge of CPU manufacturers everywhere.

The useful thing about multi-core chips is that they're good at multi-threaded processing. That sounds logical enough on paper, but it doesn't really give any indication of what it actually means. To you understand how processing works and how multiple cores can help make chips faster, think of each core as being like a lane of traffic on a motorway. Cars carry the data, and each colour car represents a different processing thread.

In a single-core chip, you have a single lane road, which traffic travels down. Cars of every colour join the same lane and can only proceed as fast as the one in front of them, whether it's the same colour or not. This means the core is serving multiple different threads, and data travels slowly because threads hold one another up.

In a multi-core chip, you have two (or four, or six) lanes of traffic, and the cars of different colours can each separate into different lanes. This allows more cars to reach their destination in less time, and means, that the streams of traffic aren't interrupted as often. While the cars are still travelling the same distance, they get there more quickly – especially if one breaks down or begins to travel slowly. It's a crude explanation of what happens inside a chip, but it's basically correct.

That analogy makes it sound as though a leap from one to two CPU cores would increase performance by 50%, essentially doubling the CPU's capacity – but other factors further influence the amount of data that can reach each core, such as internal bandwidth and storage access time, both of which can have an effect on the speed increases gained from adding additional core to a processor. The bottlenecks created by these components are outside the processor itself, so no amount of adding extra cores can reduce them.

Indeed, because of bottlenecks and a lack of optimization, when adding a second core to a CPU was first tried out commercially, it only resulted in a 10-20% performance increase. Many dual-core CPUs performed worse than single-core ones, because they ran at slower clock speed and the extra core didn't fully compensate for that shortfall.

There's a further problem in that the workload isn't divided evenly between the available cores. You can assign different program threads to different cores, which is good for multi-tasking, but modern chips are so fast that running more than one application at a time doesn't even tax a single core. Assigning a browser to one core and a word processor to other isn't likely to result in much of a performance increase, because both are so resource-light in the first place.

Where multiple cores help most is in allowing a single resource-heavy program to divide its workload between multiple cores, using multi-threading. Unfortunately, programs must be specially written to take advantage of multi-threading in this manner, and it's very rarely the case that they are. We still see only the true advantages of parallelization when programs are built specifically to take advantage of it – and given that almost all of us are running quad-core chips, it happens less than you might think.

Multi-core processing does have other advantages, of course. Having two cores means both can run slower to achieve the same performance, which increases reliability and lifespan compared to a single core of equivalent capabilities. They can also make more efficient use of available bandwidth, since one can process instructions while the other is processing it. But even now, true multi-threading is rare – especially in the places it'd be most useful to home users.

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WHAT IS 3D PRINTING?
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3D printing is a process of making three dimensional solid objects from a digital file. An object is created by laying down successive layers of material until the entire object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object. These objects can be of almost any shape or geometry, and are produced from a 3D model or other electronic data source

The first biological 3D-printer opens new perspectives in the field of recovery and implantation of organs and tissues. this is the result of collaboration between the US company and the Australian Organovo Invetech.

Surgeons who deal with transplantation of human organs, hoping that one day they will be able to obtain all the necessary organs for transplant on the first request. Now the patient can spend a few months, even years, waiting for a suitable organ of the patient. During this time, patient's state may get worse. He may even die. Thanks to artificial organs, doctors could not only alleviate the suffering of patients, but also save their lives. Now, with the advent of the first commercial 3D bioprinter, this opportunity can become a reality.

It is much more effective to print organ or piece of tissue on bioprinter instead of growing it in vitro. As ink the printer uses a stock cultured cells of the desired type (epithelial, connective, muscle). Precision print head lays cells (and auxiliaries) in the correct order. This process is controlled by computer.

3D bioprinter produced by Organovo, uses the same principle of operation as the "ordinary" 3D printers. 3D printers work like a conventional inkjet printer, but the print model has three dimensions. Such printers spray droplets of polymer that creates a single structure. Thus, in each pass the print head creates small polymeric line on the object. As a result, step by step, the object takes on its final shape. Void in the complex object supports "scaffolding" of special water-soluble materials. These scaffolds are washed out after the object will be completely finished.

The researchers found that a similar approach can be applied to biological materials! If positioned tiny portions cells adjacent to each other, they start "raft" together. Currently, we investigate a number of technologies that would allow to create human organs from single cells, such as technology, "pumping" of muscle cells by using small machines.

Printing Industry of human organs is in its infancy, but scientists already have successful examples of the creation of human organs "from scratch". So, in 2006, Anthony Atala, together with colleagues from Wake Forest Institute for Regenerative Medicine in North Carolina, USA, created the bladderfor the seven patients. All of them are still functioning.

Machine Organovo uses stem cells derived from bone marrow. Stem cells can be obtained from any other cells using a variety of growth factors. 10-30 thousand of such cells are formed into small droplets with a diameter of 100-500 microns. Such droplets retain their shape well and are perfect for printing.

Bioprinter can use other types of cells and supporting bases. So, according to Mr. Murphy, the liver cells can be applied to a preformed base shaped body. Thus the new printer has modest dimensions such that it can be safely put in a biological cabinet for sterile medium during printing.

Some researchers believe that these machines will ever be able to print tissues and organsdirectly in the human body! In fact, Dr. Atala is now working on a printer which after the scan area of the body that require skin grafts, can print directly on the skin of the human body!

As for larger organs, the doctor Forzhak considers that they can take various forms, at least initially. For example, in order to purify the blood, artificial kidney does not necessarily have to look like a real kidney. People who are waiting for organs, probably will not be much worry about how to look new organs. The main thing is that the organs are working, and people feel better. Organovo that later the machine may appear in the clinics.

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SOFTWARE PROTECTION TECHNIQUES
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Software development is an integral and the most dynamic branch of the IT industry. Software much like a physical product has its own manufacturing process, is offered for sale and is protected by the copyright law. Despite of the latter fact, there's no guarantee the end user will comply the license agreement. Given this the software developers face with the need to:

- protect the source code and the algorithms from being stolen,
- protect the software from being stolen (illegally copied).

The solution of both problems boils down to protect the software product from being decompiled (i.e. converted back into a human readable programming language) and/or modified. The aim is to complicate the reverse engineering of a program as much as possible, but the protection method you can use depends on a single factor – the programming language the application was written in.

Binding to the medium is one of the first protection methods which is applied to the storage device the software is supplied on (CDs or floppy disks). The program can be started only from its medium which in its turn is protected from copying. This technique was quite widespread in 2000s, but soon became irrelevant because the bypass methods were found. Another reason this protection technique can be met rarely is that CD disks are almost out of use (floppies are not used long enough) and that nowadays most of software sales are performed online.

A program written in the compiled language like C++, Pascal or Ada is translated into a binary file containing platform specific machine instructions. This binary executable can be disassembled into a list of low-level language commands which are much easier to analyze than the raw opcodes. Additionally it can be run under debugger – an external application which allows you to execute the target program step by step. This helps the cracker to understand the algorithm of the analyzed application. Several methods can be used to obstruct the disassembling or debugging of a compiled program.

Anti-debugging techniques strongly depend on the target operating system the program will be run in. Their task is to detect when the user tries to debug the application. The program shuts down immediately if such attempt is made.

Specialized tools like protectors and packers operate with the final binary file by modifying its executable part. Simple protectors replace some machine instructions with non-trivial, but equal by its functionality instructions, in order to hamper the analysis of the program. Packers encrypt the important parts of code hiding it from the disassembler. The most sophisticated tools convert original machine instructions into its own bytecode which is later interpreted by a mini virtual machine. The main disadvantage of using protectors is that they usually harm program's performance.

Operating system protection level implies using undocumented OS features or modifying its kernel by installing additional drivers. The latter work with a higher level of

privileges than ordinary applications, intercept and neutralizing all attempts of an unallowed access to the components of the software product.

Hardware protection requires the use of an external device (*dongle*) which acts like a key unlocking the application. A key is usually a USB device supplied with additional drivers. A program sends commands to the dongle via the driver and performs certain actions depending on the device's response.

Programs written in interpreted languages have less protection options to choose from because of their peculiarity. C# and Java program code is translated into the intermediate form (byte-code) which is executed by the virtual machine. The problem is that the byte-code can be easily converted into the original source code and there is no way to protect it from being decompiled. Desktop applications written in a script language (like Python) are supplied as a set of ordinary text files (scripts), which gives a full access to the original source code.

The only way to complicate the analysis of a program written in an interpreted language is to use obfuscation tools. Obfuscators replace meaningful variable and function names with shortands or abbreviations, making the source code unreadable.

There is no guaranteed method to protect a desktop application written in any programming language from reverse engineering. Cracking a new protection mechanism which pretends to be more effective than all existing ones is always a question of time. So the criterion of a good software protection is the amount of human and time resources needed to be expended to bypass it.

A rather new solution, but completely different from the above-mentioned methods, is to use "software as a service" software delivery model (SaaS). The user accesses the needed application through the web-browser while the logic part of the software is hosted on a server. This fully eliminates both source code concealment and software piracy problem, because the only way to use the software is to buy a subscription for it.

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DO MODULAR SMARTPHONES HAVE FUTURE?

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What is a modular smartphone? Talking about an ordinary form of a smartphone we can say that basically it is a headset. But it can be upgraded by swapping or adding individual components, or modules, using a plug and play style. Upgrading it to a PC can be done by adding a new motherboard, CPU or graphics card-taking out the old and adding the new one component at a time.

It can be compared with Lego. Basically, you start with a bare-bones shell. Memory, battery, processor, camera and all other modules can be added later, creating a smartphone that's good enough for you.

It is the best phone for an ordinary user because every time there is an updated version of one of your modules, like a better camera, you can add that module instead of wasting money for a whole new device. There is a possibility to opt for a better battery instead of adding a new camera, for example.

Have you ever heard the term "Project Ara"?

This project is being developed by Advanced Technologies and Products (ATAP) organization. There are other developers like Phonebloks.

Project Ara creates new modules, that slide in from the side, held in place by magnets. The device uses wireless "capacitive interconnects" instead of using unreliable contacts. At the moment there are three different size-dependent types of module: "small square" – the smallest one,"big square" – mid sized and "rectangle" – the biggest one.

Unexpected situation happened the night before Google's Advanced Technology and Projects (ATAP) division was supposed to show off the one and only functional Project Ara prototype to a room full of eager developers. Someone dropped the phone and broke the display and the whole presentation was in danger of being canceled. Any other company this would be the worst-case scenario. But Google handled it with no problems. The company made lemonade out of a lemon by turning it into a selling point for the modular smartphone. Painful situations like this might be easily fixed just by buying a new display and swapping out the crashed one.

Thus, to my mind, modular smartphones have future and "Project Ara" is a good example of that.

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USE OF AUDIO CHANNELS FOR INPUT / OUTPUT DATA FOR DEVICE ON OPERATING SYSTEM ANDROID

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This article describes the specific implementation method for transmitting data using an audio channel for devices with Android operating system (further in this article operating system Android will be meant by the acronym OS). In this work the author suggests the concept and implementation of a scheme for such devices.

Author suggests using the channel that is designed to output/input audio signals because OS does not allow programs which are not systems to work with the modules of the device directly. All applications work only with API, which is given to them by OS, that is why the new modules which are not prescribed by OS have many problems with installation. These problems can be solved by using the audio channel, which can be used by all programs in the device.

It should be noted that suggested method is not new. It's actively used by toy manufacturers for creating interaction between their products and the client's device (smartphone, tablet), but interaction is only in one direction. That is why the client's device can only send data to module, but it cannot get data. The problem is connected with using only channel of audio output signal. The author suggests using channel of microphone to solve this problem.

For this conception it is necessary to write a library that will allow taking under control the audio channel of the device and will be able to decode the incoming audio signal

from the microphone into a sequence of bytes and to encode transmitted bytes into output audio channel signal. It should be noted that in devices there are usually two output audio channels − left and right, with their help two modules can be manipulated at one time, but one of the modules will not be able to transmit data to the device without the complication of the suggested concept.

With the software part all is pretty clear. The main problem is in electronic part because it is needed to make the device that can convert analog input audio signal (from a microphone channel) into digital and inversion of output signal (speaker). Fig. 1 shows solution of the problem which consists of using DAC and ADC.
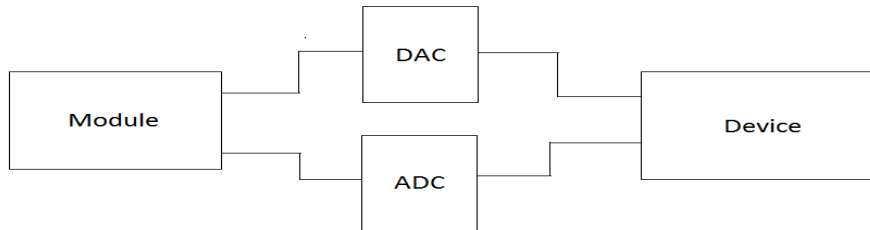
Fig. 1 The general concept of interaction

Figure 1 shows the general principle of interaction, which has one problem. For data transmitting we need to develop a mechanism that will simulate the work of the microphone and convert the signal from the DAC into the change of capacity of the capacitor (watch C on Fig.2).
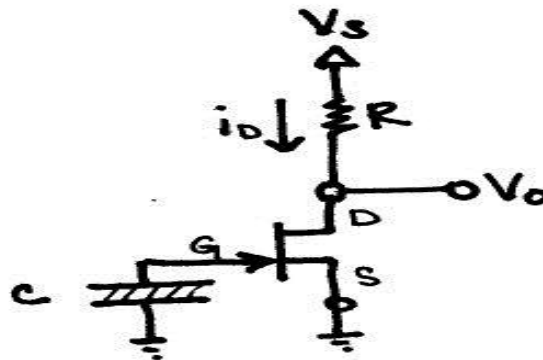
Fig.2 Equivalent schematic of electret microphone

In general, this method will be beneficial when using wireless transmission such as Bluetooth and Wi-Fi is impossible. Also disadvantage of this system is a low data rate.

The biggest problem that is needed to be solved is that the OS for the input audio signal uses compression algorithms, which tends to the original signal corruption.

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FUZZY LOGIC

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Fuzzy logic has been used in various pattern recognition tasks since it was introduced by Zadeh in 1965. Fuzzy logic is a mathematical approach to solve problems. In classic logic, an object takes on a value 0 or 1 but in fuzzy logic, a statement can assume any real value between 0 and 1, representing the degree to which an element belong to given set. Fuzzy logic uses the so-called membership functions – a curve that determines how each input mapped to a membership value between 0 and 1. There are many types of membership function depend on the base set.

Fuzzy inference system is capable to map between inputs to output using fuzzy logic. The mapping provides a decision on the basis of input. Fuzzy inference systems applied well in such fields: decision analysis, automatic control, expert system, data classification.

In the main, fuzzy inference system composed of five functional units:

− rule base containing a number of fuzzy if–then rules;
− database determines the membership functions of fuzzy sets used in the fuzzy rules;
− decision making unit which execute inference operation on the rules;
− fuzzification interface which converts the crisp inputs in to degree of match with linguistic values;
− defuzzification interface which converts the fuzzy results on the interface in to a crisp output.
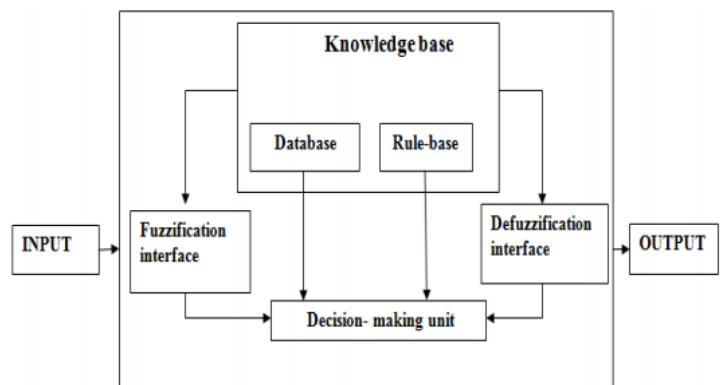
Mamdani's fuzzy inference method is the most usually seen fuzzy methodology. It waits the out membership functions to be fuzzy sets. After the aggregation, there is a fuzzy set for each output variable that needs defuzzification. It enhances the effectiveness of the defuzzification process because it significantly simplifies the calculation required.

In conclusion, it must be said that fuzzy logic is an important tool for different tasks such as pattern recognition, expert system and data classification.

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THE NEXT STAGE OF CLOUD COMPUTING

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Just a few years ago, any company trying to invent something new and extraordinary had to spend sufficient funds in computational hardware, connectivity devices, real estate for the equipment and staff to keep everything working 24/7. Such conditions created tough

requirements for company`s budget. Therefore, even if someone has a genius idea, he could just not be able to realize it.

Today, such expenditures are no longer needed to due to cloud computing, which allows to forget about maintaining own infrastructure and hiringprofessionals, so a company can focus on further development of its product. Such services usually provided by huge server farms, most of which are owned by giants like Google, Microsoft, Amazon etc., because server farms are fabulously expensive. Moreover, centralized facility can be the weakest place in case of catastrophes. Another problem is geographic location of this facility, because it might not be suitable for customers.

Computer scientists from the University of Bologna offered an innovative approach to do cloud computing not using such giant centralized server farms, i.e. using P2P (peer-to-peer) technology. The principle is similar to the one used in torrents for file-transferring operations. In theory, clouds could be built of any amount of personal devices (such as PCs, laptops, game consoles, etc.) distributed across the Earth. There are two main advantages of such strategy: 1). Cloud`s partsare tiny compared to traditional server facilities, consume much less energy and well distributed; 2). Cloud can be created without requiring the approval of any authority, so there would be no organization which has control over it.

Of course, the approach have some drawbacks. Users who share their resources to such cloud could turn them on and off whenever they want. Collection of completely different devices in a cloud mean the equipment failures or problems with compatibility will happen regularly. Another problem is that there have to be effective inducements to motivate people to share their resources.

Development of this approach currently at the early stage, although scientists have already built the prototype called Peer-to-Peer Cloud System (P2PCS). There are still a lot of problems, only a few of which they have attempted to solve. Nevertheless, if they succeed, it will facilitate the creation and maintenance of clouds, so we could eventually find ourselves making use of P2P cloud in our daily routine.

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THE COMPARATIVE ANALYSIS OF METAHEURISTIC ALGORITHMS FOR SOLVING TSP

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Travelling salesman problem (TSP) is one of the most famous combinatorial optimization problems. It is given a set of cities and a matrix with distances between the cities. The goal is to find the shortest possible tour that visits each city in a given list exactly once and then returns to the starting city.

Travelling salesman problem has a lot of real-world applications even in its purest formulation. The solution of the problem is widely used in a variety of fields: vehicle routing, logistics, scheduling, bioinformatics, network design etc.

Travelling salesman problem is an NP-hard problem. That means that the increase of amount of cities makes the problem considerably more difficult (exponential dependency causes $O(n!)$ time complexity). This is the main reason why the close to reality problems

can't be solved with exact methods (method of branch and bound, a-star search) within reasonable execution time.

Since exact methods are practically useless, metaheuristic methods are usually used for solving NP-hard optimization problems. Metaheuristic algorithms such as determined local search, taboo search, simulated annealing search, evolutionary algorithms, and ant colony optimization have produced good results for a wide range of NP-hard combinatorial optimization problems including travelling salesman problem.

TSPLIB Task	Task Type	Optimal solution	Local Search		Tabu Search		Annealing search		Genetic search		Ant colony optimization	
			$\varepsilon,\%$	t,s	$\varepsilon,\%$	t,s	$\varepsilon,\%$	t,s	$\varepsilon,\%$	t,s	$\varepsilon,\%$	t,s
BR17	A	39	0.0	0.0	0.0	0.2	0.0	5.6	0.0	4.7	0.0	0.0
BAYS29	S	2020	0.0	0.2	0.0	0.8	0.0	8.8	2.4	1.2	1.3	0.1
FTV33	A	1286	4.8	0.2	9.4	1.1	8.8	10.4	16.6	1.9	3.3	0.2
FTV35	A	1473	29.5	0.3	10.5	1.4	7.7	10.8	22.4	1.6	11.2	0.2
SWISS42	S	1273	0.0	0.7	0.0	2.3	0.0	12.3	0.9	1.8	7.7	0.3
P43	A	5620	0.0	0.3	0.1	1.9	0.4	12.7	1.0	1.9	0.5	0.4
FTV44	A	1613	23.7	0.7	26.5	2.6	12.9	13.3	33.7	2.5	5.9	0.4
FTV47	A	1776	28.4	0.9	59.6	2.6	17.8	14.2	35.1	2.9	11.5	0.5
RY48P	A	14422	2.5	1.0	1.6	3.7	4.6	14.2	19.1	5.6	9.3	0.4
EIL51	S	426	3.3	1.7	2.2	4.3	2.7	14.8	10.3	2.7	7.9	0.5
BERL52	S	7542	4.1	1.8	0.0	3.9	0.0	15.0	11.9	3.0	8.2	0.5
FT53	A	6905	27.7	1.8	49.8	4.0	12.7	15.4	41.5	4.0	14.9	0.6
FTV55	A	1608	39.9	1.9	86.8	4.7	13.6	16.4	49.1	4.1	9.3	0.7
FTV64	A	1839	62.2	2.9	83.8	7.9	19.2	19.1	47.0	6.4	7.9	1.1
EIL76	S	538	3.9	10.0	4.8	16.7	4.2	21.5	7.1	9.7	8.6	1.7
EIL101	S	629	6.0	28.0	6.2	43.7	6.3	28.3	10.0	24.1	16.7	4.0
Mean			*14.8*	*3.3*	*21.3*	*6.4*	*6.9*	*14.6*	*19.2*	*4.9*	*7.8*	*0.7*

Mentioned algorithms were applied for the same tasks to compare their efficiency. TSP was used as a source of tasks and optimal solutions for them; it contains instances for the TSP of various types.

All implementations of the algorithms used the same programming language and were run on the same machine to make the results comparable. The efficiency of the algorithms was estimated by closeness of found solution to optimal one and by time needed to find it. Since all used algorithms are based on stochastic principle every instance of TSP was solved 10 times by every algorithm.

Determined local search iteratively improves the current solution by searching for a better one in its predefined neighborhood. The neighborhood is defined by the reconnecting of two edges from the current tour. For symmetric tasks local search gave solutions which close to optimal (error $< 6\%$) within reasonable time but it fails on asymmetric tasks.

Taboo search is metaheuristic that guides a local search procedure to explore the solution space beyond local optimum by use of a Taboo list. This method gave more accurate results for some asymmetric tasks.

Simulated annealing is a stochastic computational technique for finding near globally optimum. It is inspired by annealing in metallurgy: with decreasing of temperature the probability of jump to the worst solution becomes less. Annealing search brought excellent

results but it took quite a long time to get them. Another negative side is strong dependence on options such as factor of temperature decrease.

Genetic algorithm is an evolutionary technique that uses crossover and mutation operators to solve optimization problems using a survival of the fittest idea. This algorithm is one of the fastest but found solutions are quite far from optimal.

Ant colony optimization (ACO) is based on the swarm intelligence. Every ant concurrently and independently tries to find path taking in account the experience of previous ants. Probability of moving to the city depends on pheromone trail and the distance to city. ACO gave one of the most accurate results both for symmetric and asymmetric tasks. At the same time the algorithm was quicker than other methods.

Conclusion.

TSP is widely spread in various fields of industry. Metaheuristic algorithms produce good results for TSP within reasonable execution time. Every of mentioned methods has its strengths and weaknesses and can be applied depending on the goals and restrictions of the search. Local search has the simplest implementation and can be applied as a subprogram for finding route for symmetric tasks. Simulated annealing should be used to get the most accurate results for symmetric tasks. ACO gives high accuracy within reasonable time both for symmetric and asymmetric tasks. Since the quality of the results depends on algorithm parameters, every algorithm should be reconfigured for every separate task to get the best solution.

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BEHAVIOURAL ADVERTISING

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Behavioural advertising or behavioural targeting is basically advertising which sends adverts to specific people based on what you are actually interested in by monitoring your recent online behaviours, including viewing web pages, use of keywords, use of search engines and shopping online. For example, if you have recently visited a site to find out about flights to Paris, you may be sent advertisements for hotels in Paris and so on.

Some of the most famous and the biggest companies such as Google and Facebook use behavioural targeting. Also they offer the ability for other companies to advertise using their technology and information.

Companies that use behavioural advertising have a variety of tools that will collect information regarding a person's browsing activities. Cookies are the most known and common tool for online tracking.

So, how does behavioural advertising work? Stakeholder establishes an agreement with the site owner, which adds a piece of code on his website. Then, the first visit to any
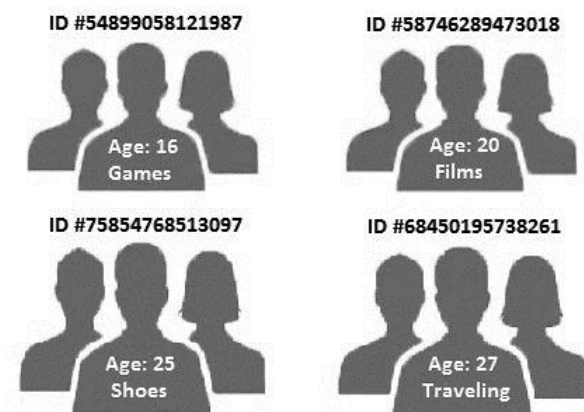
website in some company's advertising network will cause a cookie to be set on the user's browser. The cookie contains a unique random identifier for creating a searchable database for each individual.

Now with a cookie in browser the process begins. When you go to another site and start to surf the Web, companies track and record all Internet activities: what you are searching for, what you want to buy, what sites you visit and read.

After collecting necessary information a user profile is constructed. This profile includes your ID and your history of web sites that you visited. Other information may be included, such as approximate age, gender and location, data and time information, numbers of times an advertisement has been shown, depending on the company's specific implementation. Company, which collects these data, doesn't actually know who you are – they won't have an address or a name or anything.

And finally companies send advertisements that are best suited to be viewed by a particular individual based on created profile.

Behavioural advertising is expected to grow because it is very effective and it addresses some of the key industry problems: rising cost of Web marketing, increasing Customer acquisition cost and decreasing conversion rate – the amount of people who made a purchase after clicking on ad.

But behavioural targeting has some issues. Many users are dissatisfied by the idea that companies track them although ad networks and websites claim that they are not gathering and storing user's personal data (names, addresses, etc.). Consumer online privacy concerns are the biggest problem to the widespread adoption of behavioural advertising. Recall recent commotion about Facebook's announcement that it will sell users data to big ad companies.

Also, since data is not personally identifiable, tracking technology has trouble when computer are using several people, so in families marketers can't really know who is using web, unless each user has a their own log-in. Until better technology can address this issue, behavioural advertising will continue to fall short of its promise.

In conclusion, behavioural advertising isn't ideal, but it has great potential of changing the way we search for information. And this potential is growing with every day as more data is collected and analyzed.

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CONTACTLESS PAYMENTS IN UKRAINE

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Nowadays more and more people use smartphones. Smartphones have replaced most of our usual devices such as MP3-player, camera, pocket computer, etc.

Every year companies add new technologies into the new generations of smartphones. One of those is NFC (Near-Field Communication) which is a set of standards

for mobile devices to provide radio communication with each other by touching them together or bringing them into close distance, usually no more than a couple centimeters. It is built upon RFID (Radio Frequency IDentification) systems by allowing duplex communication between terminals, while earlier systems didn't have that feature.

NFC provides a wide spectrum of services. Those devices can be used in contactless payment systems just like currently used credit cards and electronic smartcards and allow mobile payment to replace these systems. However, NFC technology can be used not only in the banking sector. For example, we can use it in the area of services, such as car parking, ticket sales, etc. In particular, in the Institute of Telecommunication Systems NTUU "KPI", it is planned to develop the layout of the automated parking system, using microcontroller Arduino, XBee radio modules and contactless cards based on RFID technology.

In order to use NFC technology to pay for goods or services, we should have a mobile phone with NFC-module, and a special application for payments on the phone. SIM-card with NFC support will load the data on the bank card. Transaction for payment of goods can be done through NFC-supporting POS-terminals.

In Ukraine the first bank, which introduced contactless payments, was Privat Bank. This bank introduced the world's first Android-ATM that uses progressive NFC technology. The working title of the ATM is "Black Box". It does not have the usual display with buttons and it has NFC-reader instead.

The algorithm of interaction in the 'Black Box' is the following: in order to get cash the client should just attach the phone with NFC module to the ATM and use his phone to enter the amount of money, which he wants to get. Of course, transaction confirmation by the PIN-code is needed.

If we consider the processes, inside the ATM there is a smartphone with NFC module and the machine sends data to client's smartphone and back through NFC technology. These processes are provided by Privat24 Android app which is tied to the client's card and to the client's account. Also, inside the "Black Box" there is a safe with first-class protection and the necessary minimum of electronics.

Contactless ATMs are cheaper than conventional ATMs because they use open source software, require less equipment (don't need a keyboard, screen and other functions of the user interface conventional ATM), the service is cheaper as well, absolutely safe in terms of skimming and perform one task – giving out a cash to customers.

A working prototype of NFC ATM is currently used in the offices of the bank and the bank is planning to introduce a new design into production in the nearest future.

Contactless payments are becoming a very perspective branch of the modern information technologies because they provide the new standard of security and usability. In addition, it allows banks to build powerful and flexible systems of payment.

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BIG DATA. DEFINITIONS, PROBLEMS, TASKS
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Almost everybody heard this word, but do you really know what it means? Someone may say, that it is just a trendy phrase with no background behind it. The 2014 IDG Enterprise Big Data research report showed, that almost 48% of big and medium american companies are already implementing or planning to implement a big data analysis in the nearest future. It is easy to predict the fast development and large investments in this direction. Usage of big data researches is going to spread over the all fields of economy, sociology, customer servicing and others. Many graduates of IT faculties will be involved in this process. That is why it is necessary to understand what the big data is and why it is so important.

Big data is an enormous amount of data, which can be used to found some interesting dependences and build flexible queries, that cannot be processed using the traditional methods and applications. To simplify, big data is a set of techniques and methods used to work with unrelated and polytypic information.

Why we cannot just use the standard relation data bases and scale them for our needs? The main problem is that the relation databases store data in structured tables. It is good for simple queries, but when we will need to perform some complicated joins the performance issues will arise. The main point of big data approach is to store any unrelated data even gathered in real-time and find some useful tendencies by applying some data mining algorithms. For example, we need to find out mobile phone users who want to buy a new phone instead of their outdated one. We are gathering call statistics, billing data, internet usage, geolocation and so on. Then we define a threshold criteria using some services, high internet traffic consuming combined with the outmoded mobile. After this we can send SMS-messages to every potential client when he will be near our shop. The important thing is that we can complicate our task and also find out the most popular models which such people are choosing and use it in future advertisements. So what do we have in the end? An unstructured massive of data which can be easily analyzed, we can add more hardware resources if we have such a need, the data mining process can be paralleled for better performance.

Big data methods are used for very complicated, irregular and unordinary problems. There is no point in building a new system for something which can be handled by the relational database in a proper time.

Another good example in the marketing field is a product placement problem. In USA and Western Europe it is a widespread task. We have a massive of checks with all kinds of products for several years. After the analysis some association rules will be found. One of the most obvious is that beer is often bought with snacks. But if we go deeper, we will find a strange association between beer and diapers. This fact was discovered by American researchers. The explanation is simple, people who have little children cannot go out with friends as often as they want, but they want to have some rest. So they are buying some alcohol when going to weekend shopping. Improving the product placement in this very case was significant for sales. Also, it can be used to generate profitable and stimulating discounts. There is a lack of such implementations in Ukrainian marketing which should be improved in the nearest future.

Big data is the third generation of analysis. It combines descriptive, the one which describes past, normative, the one which tell us what to do now, and predictive approaches.

The last one is the most valuable. Just imagine if we would be able to predict people illnesses, automatically receive information about the needed country in the airport or simply believe in meteorological forecasts without any fears. The benefits of big data usage are attainable, logical and can improve every sphere of life.

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BIG DATA

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Big data is a term which became very popular in the area of information technologies. In fact, it is collection of large data sets that hard to process with usual applications because them enough computing power of conventional computers and functions of consumer software. This term is important in the Internet. But it is also applied in such areas as business, society etc.

The term 'big data' has become popular in 2013. Such popularity eclipses major discoveries in related areas.

People say that about big data is a lot of talk, but no one makes any action. Our lives will be associated with big data, but it makes a big impact on different areas of life today.

Today, the algorithms of big data are used for processing flows of messages from social networks, data streams of the location of subscribers of cellular networks. Big data help managers choose the best trading decisions.

With big data machines and computers have become more autonomous that allowing them to make some decisions without human intervention.

Data from the devices audio and video registration is processed using the algorithms of big data.

Big data is hard to work with conventional database management systems and systems for processing statistic. They require parallel computation on a large number of servers and new exclusive technologies.

Many organizations are accumulating data without thinking they really need such number of data. So data becomes useless. Therefore, the extraction of instances of useful information in this huge mountain of information rubbish is one of the biggest problems facing modern society.

The beginning of "the era of big data" refers to the emergence of supercomputers and large-scale computing systems that efficiently process massive amounts of information, making them available to perception and understanding people.

Most of people do not unaware that almost every day they are benefited from the onset of this era by typing the phrase into the search engine bar, looking at pictures of the Earth in Google Earth and using the numerous other benefits provided by the era of digital technology.

Analysts warn that big data will not manageable for all firms. Most organizations don't have the necessary technical capacity to work with "big data" or the ability to manage them. Therefore, only some of them will be able to use these data to more effectively compete in their fields of activity.

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APPROACHES FOR IMPROVING THE PROTECTION OF CLOUD SERVICES

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Anyone who is even a little engaged in information technology realizes that cloud computing nowadays is everywhere and will remain in our future. Indeed, proved forecasts say that the cloud computing market will grow rapidly in the next decades. The reason for the popularity of cloud computing is quite clear: they are designed to provide costs preserving and resource conservation in companies.

Obviously, there are vulnerabilities in terms of security, which attackers are trying to find. However, due to huge awareness about these vulnerabilities and in which way they can be eliminated, the cloud gets more secure place. In all cloud computing configurations, including individual, collective and crossbred models, most of customers share their resources with the help of different technology.

The first thing that should be taken to protect your cloud computing is to immerse yourself in the details of working environment. If the data requires secure environment, you should definitely pay attention to the type of your environment. For this situation, of course, it is preferable to use a private cloud, or perhaps some hybrid solution in which data are in a private section that allows you to have more controlling access and security.

Then you must to perform the evaluation procedure of your cloud computing provider: find out what approaches he uses for protection from vulnerabilities; learn how virtualization is used in your cloud and what the installation schedule of patches and upgrades is.

Let's look at some options for the most common vulnerabilities:

Data leakage

First of all, cloud provider must use a highly reliable encryption during both storage and transmission. Another requirement is the presence of properly customized firewall for protection the latter from a variety of attacks.

Organizations that are afraid of data loss should have valid data classification policy and the establishment of standards for handling data.

Unprotected API interfaces

For more convenient interaction of customers with cloud services, service supporter should use application programming interfaces (API). API are used to provide services, audition and administration in the cloud computing.

Reuse of passwords and token-codes, authorless access, open authentication and content delivery, as well as unbending control of access and improper authorization − all these represent a serious threat to security. In addition, there is a problem with the API interface, created by extraneous organizations. Notwithstanding that these interfaces are

often designed to provide customers with additional services, such supplements increase the risk of security breaches.

To address these risks, review and analysis of the model cloud provider security are necessary in order to verify that the provider is doing everything possible to protect such API interfaces.

Abduction and unauthorized use of accounts

Often intruders abduct users information through phishing attacks, cheating and interception using malicious software. Unique credentials and strong passwords help to prevent vulnerabilities associated with repetitive use of user information. Another way to reduce attacks of this type can be done by using two-factor authentication.

Threats from insiders

Working with confidential and financial data is very attractive to hackers. Ability to work for a cloud provider allows attackers to sale data or even taking complete control over the whole services with low risk of being caught.

So, clients should know what steps are being taken by service providers to detect undesirable penetration and protection from them. You should not only know what process of notification applies in the case of security crime in your cloud, but also demand security details and transparency of cloud service from your provider. If the timing or notification processes are unacceptable, you should look for another service provider.

In conclusion, cloud computing provides a number of very attractive opportunities to enhance the effectiveness of collaborative, distributed and remote work and for reduction of cost. Despite the fact that the migration to the cloud is associated with certain risks, these risks do not exceed those that occur when hosting services within the organization. The main difference is that the cloud provides a new field for hackers to attack. So, you should definitely spend some time to learn deeply about security approaches that are present in your cloud service.

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ADDING CLARITY TO HIGHER DEFINITIONS
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The latest tendencies in media processing industry for almost last two years were focused on increasing of sound and video quality in extensive way. If we would look on the stands of the main players in any consumers expo (such as CES, for example) since the second half of 2000s, we would notice that HD resolutions is the idea for everything. It seems that even toasters with HD displays would work better than their "screen-less" brothers.

Until 2010, all manipulations were centered on achieving something close to HD prefix, which meant that your screen got not less than 1080 pixels in height.

Later such big players as Apple, Samsung and LG introduced their versions of 'more than HD' resolutions. Someone called them "retina" or "Super HD". Nevertheless, by forced evolution of pocket devices' screen resolutions they provoked a leap ahead, for the entire industry.

"Holy grail" for today is something completely different, mystical combination of number and letter, the almighty 4K came to us from the world of movie theater industry.

There is one simple difference in marking of resolutions for average customers and movie industry professional. While we all are using marking shared from IT sphere that takes its origins from binary system, they feel more comfortable with decimal system. That is why you will hardly ever hear something like "720p" or "1080p" in conversation about movie theater's gear.

Transcription of 4K is easy and means 4000 pixels width. Today 4K resolutions are the best what contemporary cinema can offer. Moreover, to be honest, it's more likely that you won't even notice the difference between 4K and backward 2K resolution. Pixel density in this case is so high that it's almost can't be seen by man's eye.

Even though, when the resource of HD variations was exhausted, marketers found a new way to amaze the customers – 4K or almost 4 times more dense resolution than any possible HD.

But once again, marketing tools are overtaking technological possibilities. The main problem and bottleneck of 4K technology is super volumetric size of playback file. It takes nearly 400 GB for average 90-minute films, not to mention such epics as "Lord of the Rings".

So, to watch "raw" 4K file you'll need a lot of hard drive space and for sure thing super good and fast Internet connection, otherwise you will watch extra-clear slide-show. On the other hand, now we've got new h.265 codecs, that are able to compress 4K files without quality losses, with appropriate frame rate and with comparatively small file size. Even popular streaming services such as YouTube are allowing posting videos in 4K definition despite the fact that there are probably thousand or less devices in use able to playback these videos.

What is left undecided, whether customers really need such technology or not. Even on cinemas» screens difference is not that evident. Now try to imagine how you would find it on your 40-inch TV or 4-inch smartphone screen.

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THE FASTEST NETWORK IN THE WORLD

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255 Tb/s: The fastest network in the world is able to pass all Internet traffic over a single fibre. A joint team of researchers from the Netherlands and the United States broke the world record for the fibre optic network, being able to transmit 255 Tb of data per second over a single fibre. This is equivalent to about 32 Tb/s or, equivalently, – the transfer of the entire contents of a hard drive Tb per 31 milliseconds.

To see 255 Tb/s in the future: the fastest commercial compound, according to the single fibre capable of transmitting 100 gigabits per second, is 2.55 times slower. 255 Tb/s as the imagination is much greater than the total capacity of all the cables – and those are hundreds of optical fibres – which today rest on the bottom of the Atlantic Ocean. In fact, 255 Tb per second is equal to – or even exceeds – all the traffic passing through the Internet during peak loads.

How the researchers from the University of Technology and Eindhoven University of Central Florida were able to do it? Of course, by using the multi-core fibre. To date, the whole basic infrastructure of the Internet consists of a single-mode glass fibre and plastic. Such waveguides may transmit only one mode of light, which in fact, means that they can transmit the light from only one laser.

Multi-core fibre also allows multi-mode transmission. Historically, manufacturing of a high-quality multimode fibre was difficult and expensive, but these barriers seem to finally begin crumbling. In this case, the research team used a fibre with seven cores arranged in a hexagon shape. They applied the spatial multiplexing to achieve speed of 5.1 Tb per carrier, and then – the wavelength division multiplexing to fit 50 of carrier signals of seven cores – obtaining the same sum of 255 Tb/s. And all this was done not on a laboratory demo installation; a fibre optic line was a kilometre long.

Sooner or later, the multimode fibre is likely to replace the single mode one used now. But given that this upgrade will require re-laying of a millions kilometres of new multi-core cables, it is a very long-term process.

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ONTOLOGICAL MODEL OF THE KNOWLEDGE PORTAL

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The knowledge portal is a specialized information system allowing us to perform representation, systematization and structurization of knowledge of the given domain data, and also apply to them effective methods of search.

Today two approaches can be selected from the existing set of models of the knowledge portal representation, which differ in their concepts: empirical and theoretically reasonable. The study of the principles, simulation of mechanisms, solution of tasks by a person and the organization of human memory are the cornerstones of the empirical approach. Using the heuristics in the models of this type requires an accurate proof of the decision for each separate case. Theoretically reasonable approach guarantees the accuracy of solution of the tasks regarding the intellectual data handling area. However, it is necessary to use not only theoretically reasonable approach to solve tasks of the development of the knowledge portal, but also to use any empirical models as the auxiliary ones.

The ontological model of the representation of knowledge gained great popularity. Its cornerstone is creation of the specific system of concepts which describes certain domain data. The undoubted advantage of the ontological model is the opportunity to provide new knowledge.

The structurization and the placement of information resources on the portal by using the ontological model of the knowledge representation happens in a way, convenient for an ultimate user, that allows us to realize saving of the portal information items, their described components, and also helps to organize job oriented means of navigation and search in the information space of the portal.

Formally the ontological model of the knowledge portal can be set as follows:
$$O = \{C, A, R, T, F, D\},$$
where

C –is a set of classes describing concepts of certain domain data;

A – is a set of attributes describing properties of concepts and relations;

R – is a set of relations which are set on classes. There are the following types of the relations:

− the associative relation which allows to realize search in the contents;

− the relation "part-whole" which allows to establish the connection between classes at the level of the hierarchy;

− the relation of the inheritance which realizes the transmission of all attributes from the parent class to the child one;

− the relation "class-data" which allows to connect the copies of concepts to a class;

T –is a set of types of values;

F – is a set of restrictions on value;

D – is a set of copies of classes.

The copies of the concepts classes and the relations defined in the ontology of the portal are its information filling.

The formation of the items of the ontological model is built with the help of theory sets. The description of the connections between its items can be displayed by using the algebra logic operations.

As it was told earlier the ontological model of the representation of knowledge is the most widespread thanks to the range of advantages such as: the opportunity of storing a large number of the connected information, the opportunity of the rapid access to the required knowledge due to the easy search and the opportunity of the extension of the knowledge portal by creating new semantic connections.

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HIGH-LEVEL JAVASCRIPT OPTIMIZATION
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JavaScript is most popular and widely used client-side web programming language. JavaScript is best for interaction, controlling the browser actions, asynchronous communications and document content manipulation. In a very particular cases it is used for server-side network development with a help of Node.js, game creation industry and mobile

application interactions. JavaScript is imperative, dynamic and functional programming language with implicit and explicit delegation methods. Otherwise, JavaScript is a loosely typed language which places a responsibility for static type management for an engineer, slow language when user tries to do tasks which JavaScript is not good at. All browser vendors such as Google Chrome, Mozilla Firefox, and Opera Software Foundation tried as much as possible to optimize client-side based language using prediction methods and arithmetical optimization. Other ways to optimize JavaScript code within the development process are described here.

There are four main optimization ways to provide high-speed non bugged JavaScript code: local variables, avoiding references to objects, strings concatenation and data buffering.

As for local variables, their usage should be as much as possible. Is the part of the source code contains constantly repeating variables, it's worthwhile to create additional separate function to make optimization. The main problem for global variables is that they are stored in highly-populated namespace. The browser should look up for object properties and global variables every time you make a function call. Many functions also can correlate with objects properties, for example *event()* function and *window.event()* are almost the same. This convenience costs a lot for browser virtual code translation machine.

Using local variables can save up to 10 times more processor time as global variables. On a typical computer global variables computing last for 358 milliseconds as local variables last for only 60 milliseconds. Such kind of improvement is worth using at the analysis development stage.

Each time an engineer tries to use object reference the performance issue is occurred. This is commonly happened because of assumption that compiler knows the value of real-time changing JavaScript object. Each time the object is changed processor should spend some time to recalculate the property (for example the length of a string, *myString.length()*) and provide the new value to the object. Also, adding one character to a string can cause adding multiple bytes of memory because of HTML character entity (space point can be converted to * * symbol array).

The avoidance can save up to 2 times more time for the user. The function call without the object references lasts for 22 milliseconds while the normal function call lasts for 45 milliseconds.

The main thing about JavaScript string is that they are immutable. This causes multiple performance issues when the user tries to append 1 byte to 100 bytes string. The result as usual will be 101 bytes, but compiler will provide 1 byte for the first object, 100 bytes for the second object and 101 bytes for the result object. As the result the system spent *1 + 100 + 101 = 202 bytes* for simply appending 1 byte string.

For creating 100 characters it takes 10000 milliseconds of processor time while for creating 200 characters it takes up to 40000 milliseconds. Clearly this kind of a problem is a huge problem. The solution is the recreation of string as few times as possible.

Speaking about data buffering, each time user enters information to a field at the web-site the system tries to count the best data input size for incoming strings or numbers. As there is no information about the data which is entered at the moment, the compiler tries to create as much data space as possible for this input. The engineer's role is to optimize the source code to find the optimal size for buffering data to match the perfect size. The way to do this is creating data objects into several parts and process each part separately.

At the other hand, optimizing the data buffering size is a big experiment which can cause much harder performance issues. The best practice for this is task is using 64 bytes information blocks for each processing task.

To sum everything up, each optimization should resolve the problems it is connected to. Pre-optimizations can cause a lot of problems even if an engineer didn't want to do any harm. Optimizations should be used only when your code began to be slow and not user-friendly.

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AUTOMATIC SUMMARIZATION OF NEWS

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In nowadays we read a lot of text information, which increases every day. In this situation, the problem becomes particularly relevant automation of processing large volumes of text data, such as to obtain a compressed representation of documents - abstracts or annotations.

One of the areas of automatic text compression is a summarization of news. Summarization allows to convey the basic meaning and reject information that is repeated or has little weight. Many information resources has short parts of news, which shows the most actual information for the period. This parts is usually generated using automatic summarization.

The aim of this work is to improve the existing methods text abstracting news.

Methods for automatic summarization based on the detection of primary text document fragments containing previously stated semantic aspects, and on the formation of these essays extracts. Parts of text are chosen using formal features, such as the frequency of use of words. Unfortunately, this approach does not always guarantee the selection of the most important information from the text, so these essays serve mainly search and communicative functions. Methods for automated summarization divided into: statistical, positional indicative.

Approaches to automatic summarization divided into two categories. In the approach, which does not provide support for knowledge on the use of some general rules that are independent of application domain and language. The approach is based on knowledge, based on the assumption that for the quality of reports you can better understand the content of the text. In this case, the expected use of the knowledge base of significant volume that contains rules that depend on the domain and language processed documents. These two categories are not mutually exclusive and it is possible to share. In this article an approach that does not provide support for knowledge.

Summarization is performed for articles, so we made the following amendments to existing algorithms:

1. To achieve greater information content and readability necessary to reduce the weight for very large and very small sentences.

2. To calculate weight factor is introduced factor K, which increases the weight of the words in bold, italic and underlined.
3. Article title has a great informative, so the coefficient K for words included in the title or subtitle, increases.
4. Summary has a great informative if captured words with the request of users, so K is for word-requests is sufficiently large.
5. News are characterized by frequent repetition of useless words, so the words, which repeat in the same sentence, weight decreased.

A promising direction for further work on the subject of this article is analyzing the methods of abstracting based on knowledge and using these methods to different text styles.

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SELECTING A SOFTWARE DEVELOPMENT METHODOLOGY
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The very first thing we encounter for every project is "Which of the development approaches should I use?" This is a choice that is getting lots of disputes. It is not a type of project managing or a technical related item even though you can frequently hear these two standings appeared together or used individually. Two most popular approaches are Waterfall and Agile.

Waterfall is a rectilinear approach. It was proposed in 1970 and was referred to various medium and large development companies.

In an uncontaminated Waterfall project, steps represented as action sequences, and each of these actions should be finished before the next one can be started. There are pros and cons round the Waterfall.

Benefit is that all or most functionality and design requirements must be agreed before the first line of the code would be written, surprises that can affect timelines and budget are less possible. Because of all targets are set it's possible for a number of team members to be involved to the process or be participated in other tasks. Excluding analyses, approvals and sync meetings, the client attendance is not a must after the all requirements were settled. To finish, the product can be designed more sensibly, centered upon a whole understanding of all expected results. This provides a better design with fewer probability of the 'disconnected effect', a phenomenon that can happen as parts of code are defined but not fit well inside of the whole project.

But there are few problems using Waterfall approach.

The greatest one is that everything is already planned and there is no way back and if requirements were not effective enough it can fail the project. In addition, Waterfall methodology do not serve the customer with ability to be involved at every step so it can increase client frustration and diminish chances of success.
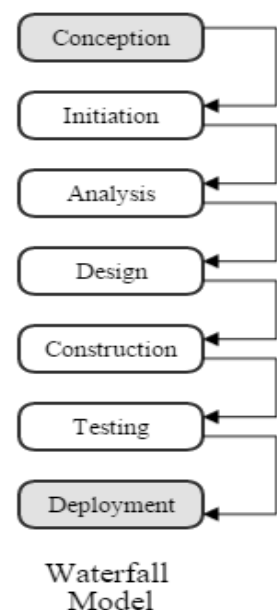
Agile is an iterative approach. Agile was presented in 2001 in Utah. What are the pros and cons of Agile? The first is that you are always ready to give a time-to-market version of the product. It can be done because of the way Agile works. All the time encapsulated into the 'sprints'. Sprint duration is fixed and cannot be changed as well as additional tasks cannot be added on the go. Before and after each sprint customer can reorder all tasks according to business values.
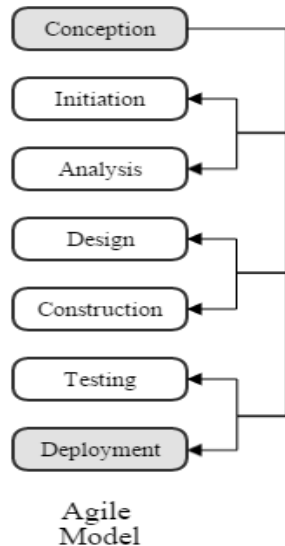
Agile
Model

Also, Agile provides very good risk management because of small incremental releases and some parts can be changed or totally replaced according to business needs.

Agile is not perfect. The first of the problems is that you cannot just take the pure Agile model and use it. You need to spend a lot of time adapting it to your company and teams. Also, you can get the best result only in small teams but not for the big one. Another problem is that Agile lacks project management process, because most of management tasks team is doing without involving project managers.

So, every time you are starting a new project, you need to weigh the pros and cons of each methodology and choose the best one for your project. What is more important for you: know all requirements being on the start line and not be aware that client would change them all the time or be more flexible and be ready to change development direction if it's necessary?

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SMART HOUSE

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In today's complex and rapidly changing world, intelligent technology for home and home automation have been developed to make life easier! Thanks to modern devices, you can now link and manage all of the systems and machines in your home from a one digital interface. What feature does the digital home have in the early 21st century? What makes it smart?

Any equipment in your house that uses electricity can connect on your home network and at your command. The house will react to your actions from smartphones and tablets.

Any equipment in your house that uses electricity can connect on your home network and at your command. The house will react to your actions from smartphones and tablets.

Much of this is due to the stunning success of laptops and communicators. Small computers are everyplace, and their connection to the Internet greatly expands the

possibilities of working with them. In this way it provides opportunity to control them remotely.

The possibility for devices to communicate with each other will provide new functionality to every device in a house. Access to the Internet provides great opportunities. Devices will be able to request service when they needed to care of qualified repairers. As these devices will be currently implemented technology, companies can very easily make smart home technologies.

The concepts "digital houses", "intelligent homes" and "home automation" are often used interchangeably. In essence, they embrace two approaches to classifying the technologies that shape the use of the home:

First, the notion of intelligent or smart building captures the idea that the material environment of the house and home tasks can be automated. Automation can range from simple fixed applications with predefined and pre-established operations, through programmable applications and devices to fully flexible and automated applications and networks of devices that share information and provide it to consumers.

From a functional perspective, automation can be designed for convenience. Central locking of doors and windows, lights coming on when someone enters a room or telephoning the house to start the bath running are all examples.

However, the emergence of digitally based ICTs is now offering the potential to greatly enhance the functionality of the home by providing an interactive window to the world outside and by providing us with information and feedback that was previously impossible to obtain.

The second broad area of smart home technologies therefore stresses the notion of the "informational" home, where existing and new information services are used to improve the management of family and professional life. These services can range from the improved distribution of existing prevalent electronic communications (analogue TV, telephony) to new electronic services (broadband Internet access, digital TV).

Some information-based services are provided on a non-customised basis as part of general entertainment or educational services, either "pushed" by the service provider or "pulled" by the customer.

Developments in ICT and the emergence of new service providers are, however, also creating the possibility of more customised services, provided direct to individuals or to the homes in which they live.

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NETWORK-ATTACHED STORAGE
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Network Attached Storage (NAS) is the network system of data storage, repository.

At the beginning of 1980 "Newcastle Connection" Brian Randall (Brian Randell) and his colleagues from Newcastle University demonstrated and developed remote file access across multiple UNIX machines.

In essence, it's a computer with a certain disk array connected to a network (usually local) and supporting work on accepted protocols in it. Often NAS drives are combined into RAID-array. Several such computers may be combined into one system.

NAS provides a reliable data storage, ease of access for many users, ease of administration, scalability.

NAS unit is a separate computer which can be designed on any architecture. The main purpose of this computer is to provide services for storing data to other devices in the network. Operating system and software of NAS-modules provide the data warehouse and file system operation, file access, and control of system functions. The device is not designed to perform common computing tasks, although running other programs on it may be possible from the technical point of view. Typically NAS-devices don't have screen and keyboard, but they manage and configure by network, often with a browser, through the connection to the device on its network address.

Lately, so-called mini-serveres, in which NAS functions combined with additional services, such as photos, media center, BitTorrent and eMule clients, mail server, and so on, are spreading. These devices are primarily designed for the SOHO-market, so rarely more than 4 hard drives are set in them. Primary benefits of such systems consist of their low price as compared with high-grade servers and large-scale integration.

Very often during the expansion of a company when increasing of total disk space is required, managers face with a choice between servers and NAS to provide only public file sharing. In this case, NAS have advantages not only in price, startup speed, ease of adjustment, but also in cost of maintenance.

Typically, the power consumption of the NAS to 90% depends on the number and type of drives, and only then – from embedded processor and memory.

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COMPUTER GRAPHICS AS A SCIENCE

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The notion of "computer animation" is a main mixture of visual poetry and mathematics, the ideas for the realization of some impossible dreams and a real tool and instrument for visual enlightenment. It is a kind of discipline which can be, approached and regarded from the directions of science, art and just only curiosity. There is a large, and an ever-increasing growing, resource of books dealing with the mathematics, geometry and programming of computer graphics, but only few of them deal with animation.

It is known that computer graphics and animation have become familiar to all of us through popular video games and films. Highly sophisticated computer graphics are now used in the creation of special effects and many films already have "entirely computerized" villains and heroes.

It is obviously not possible to deal fully and thoroughly with every development within the discipline, and the necessary abbreviation sacrifices detail in favour of a broad general full understanding.

How do these graphics turn out looking like the real thing? There are two basic methods that graphic artists use. The first one, the paint system, is similar to the way when

the artists make a simple painting. This method is almost always used to create the fixed background images that we can see in computer games. In this method, the computer-user draws the picture on the computer screen using a special software program called a "paint program". However, the quality of a paint program image depends mostly on the user's drawing ability. The computer simply assists with such things as filling in areas with color, changing specific colors or creating and "playing around with" geometric shapes. Limited knowledge of computer programming is not a disadvantage in this method.

The second method is quite different from the first because the designer does not do any drawing. Instead, the computer is given enough information to help it draw the scene itself. In this method, the user / designer has to describe the scene and its colors and textures to the computer. In addition, the computer must be programmed to be able to draw reflections, shadows and highlights. Describing these things to the computer requires skill too, but not an ability to draw well. Using this method, the user can easily change the scene by asking the computer to draw many different views of the same object. For this reason, most of the computer-generated images made for films and television, as well as many of those made by architects and interior designers, are created using this method [1, 247].

The development of computer graphics that is most likely to have a great impact on film production in the future is that of "synthetic, artificial actors", or "virtual human beings". These are pieces of software that will represent human actors in the form of "models", which will take place of real actors in some movie scenes. Already developments are so impressive that we are likely to see much more frequent use of this technology in all likelihood, we will soon be unable to tell them apart from real actors.

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SMART WATCH GENERATION
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Smart watches are one of the most advanced and popular trends in modern electronics. Being carried on the body, gadgets have been long described by science fiction writers, and now they are becoming a reality.

If we take the usual wristwatch, the "smart watches" are obtained by adding thereto the following functions and their combinations:

1. Ability to run external programs.
2. Telephone module.
3. Ability to display a notification from phone.
4. Sensors for determining the activity of the user.

In addition, all the developers have to address three major challenges: battery life, convenience, compatibility.

Undoubted advantages of smart watches – they are waterproof, dustproof and resistant to impacts, falls and other hazards resulting in damage. The watch with the degree of protection being IP57 is not afraid of any moisture or dust. This means that it will accompany its owner everywhere in all weather conditions, even being able to stay under water for some time.

Such innovative gadget as smart watch is equipped with special software, designed by the renowned progressive professionals. Among the useful programs there are those which allow without any problem to communicate with family and friends in various social networks, engage in fitness, solve ongoing daily tasks, edit images, and have fun. From this diversity of applications each can choose one that will suit his needs and interests.

Unique watch, worn on the hand, can perform a variety of functions: to operate a smartphone with the integrated remote control, to perform the necessary calculations on a calculator, and the compass will point the right way. You can also use the stopwatch and timer. Due to the fact that the screen displays interactive elements, you can post them on your own. To adjust the clock the available widgets, themes and wallpapers are used.

Smart watches usually include cameras, accelerometers, thermometers, barometers, compasses, chronographs, calculators, mobile phones, touch screens, GPS-navigators, speakers, the planner and others. Some watches have the functionality of sports (or fitness) trackers containing the training programs, route tracking, heartbeat sensors and pedometers.

Nowadays, a lot of researches concerning smart watch exist. The research company GfK interviewed 1,000 users of smart watches and found out that every third owner of such gadgets is getting rid of them six months after the acquisition. Despite all of the functionality of smart watches this category of devices is only 11% of the market of portable gadgets, underlines the GfK study. Fitness Trackers account for 26% of the market, and the action-cameras such as GoPro – 24% of the market.

But over time, people realize that the device is capable of many other things, for example it can be used to adjust the thermostat and control other home devices.

The researchers Carnegie Mellon University, USA, suggest to expand the screen of the wearable device by the user's hand. The Skin Buttons project experts have created a display that projects interface control button onto the skin of the hand. Thus, their pressing is read by the corresponding infrared detectors. The laboratory samples have 98% recognition accuracy of the buttons being pressed by the user on their own skin. Currently, researchers are working to minimize power consumption. Projectors in the created device consume up to 1.7% of battery charge every hour, which is set in the Galaxy Gear - this is one of the most popular versions of smart watch among users.

The American company Ritot is preparing to launch mass production of the world's first projection watch. Ritot watch at first glance looks like a regular bracelet and has no tiny touch screens on which information is displayed. All data appear right on the user's hand with the help of the built-in projector bracelet, which supports more than 20 different colors. The bracelet is equipped with the quiet vibrating notification mode and built-in timer with the watch itself.

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FLASH OR HTML5

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Adobe Flash (formerly called Macromedia Flash), or simply Flash is a multimedia platform from Adobe Systems designed for creating Web applications or multimedia presentations. Widely used for creating advertisment banners, animation, games, and playback of video and audio recordings on the web pages.

Undoubtedly, HTML5 considerably pressed Flash. They are already used on par in web development. In most cases, but not all. In the future, Flash will be less widely used in simple animation. But it's not extinct yet. With the new power and strength, it shifts into the gaming industry with the console-quality graphics. Of course, the simple web game seen 2003 -2006, can be made on HTML5.

A new version of the programming language for Flash is already in development – it will be a completely new ActionScript- version 4.0, which will have better performance. Some logical and technical changes will be introduced to the coding principles. General concepts will become somewhat closer to the C ++ standard. And even now the source code can be protected against theft, C ++ modules can be embedded to run directly in your browser. Those things are impossible in HTML5. All advanced applications were, are and are still being made only in Flash for a number of reasons:

− Wider opportunities for working with a microphone, webcam.
− Ability to create Flash applications for Multi-touch screens, software for offline use with hassle-free transfer of the application to a web or mobile device.
− With Flash by Adobe Air, you can create applications to work with Kinect.
− Efficiency in all browsers with Desktop / Notebook platforms. That's more than 90% of the all devices use by website visitors.
− Ability to protect data and content from theft.
− Cross-platform. You can make the application to work in the browser or available for download from the AppStore or GooglePlay. It will work the same on all platforms. You only need one developer for all platforms instead of one person per platform. This alone allows cutting the costs by 300%. Flash has come a long way from the simple vector graphics editor to an integrated platform with the broadest capabilities. For some, the transition from pure animation to the platform of Internet-based applications and games may seem redundant, but the opportunities by Flash to countless artists, animators, developers and designers completely negates this "excessiveness". The future of Flash as a tool for online animation looks a little foggy – SVG, JavaScript, and CSS3 can easily replace this complex package of programs in many areas. But as for Internet applications and game development, Flash will for many years remain the best choice for the developer.

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CLOUD SERVICES
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Nowadays such technologies as cloud computing, cloud data storage are gaining more and more popularity. After the superficial analysis the following questions will be answered: Why cloud computing is better than a classical scheme of the network infrastructure? What is the main reason many organizations are moving to the "cloud"?

The development of multi-core processors grows of the storage size, decrease of the cost of storing 1 MB of data, development of multi-threaded programming techniques, development of virtualization technology, increasing bandwidth – all these factors have led to an increase in the competitiveness of cloud computing in the IT field.

What are the main ways of use cloud technology?

Experts estimate the potential of cloud computing as very high. And, accordingly, it is possible to get into this stream and grab a part of it working in the following areas:

1. Ability to provide cloud computing services is not available for many companies because they are require a significant investment for building and development of the data center.

2. Development software for building a virtual infrastructure. Outsourcing, administration of clouds – specialists of administration and counseling in the field of cloud computing will be required.

3. Companies of development and design of a hardware equipment to create a "cloud".

4. Design is a scope that covers most of spheres ranging from data center design to software development.

After analyzing data of the functioning and performance of clouds the following list of advantages and disadvantages can be presented.

Advantages:

Availability – The clouds are accessible to everyone, from anywhere with Internet access from any other computer that has a browser.

It allows users (businesses) to save on the purchase of high-performance, high-priced computers.

Low cost – the key factors to reduce the cost of using cloud are:

− Reducing the cost of maintenance of virtual infrastructure
− Payment for the actual use of resources
− The use of the cloud on a loan
− The development of the hardware of computing systems reduces the cost of equipment.

Flexibility – unlimited computing resources (memory, CPU, disk drives) through the use of virtualization. The process of scaling and administration of "clouds" becomes quite an easy task, as the "cloud" on its own can provide you the resources you need, and you only pay for their actual use.

Reliability – reliability of "clouds", especially those in specially equipped data center is very high as such data centers have redundant power supplies, protection, professionals, regular backups of data, high Internet bandwidth, high resistance to DDOS attacks.

Security – the "cloud" services have a high enough security level with its proper maintenance, however due to neglecting the effect can be completely the opposite.

More processing power – you as a user of a "cloud" system can use all of its computing capacity, paying only for the actual time of use. Enterprises can use this feature to analyze large amounts of data.

Disadvantages:

Permanent connection to the network – to receive access to the «cloud» a constant connection to the Internet is needed.

Software and its customization – there are restrictions on software that can be deployed in the "cloud" and provided to the user. User software has limitations in the software used, and sometimes do not have the ability to customize it for their own purposes.

Privacy – confidentiality of data stored in a public "clouds" is currently causing a lot of controversy, but in most cases, experts agree that it is not recommended to store the most valuable for the company documents in a public "cloud", as there is currently no technology that would guarantee 100% confidentiality of stored data.

Reliability – with regard to reliability of stored information, it is needed to say that if you lost the information stored in the "cloud", then you have lose it forever.

Security – the "cloud" itself is a sufficiently robust system, but the penetration of an attacker gains access to a vast data store.

Another shortcoming is the use of virtualization, which is used as a hypervisor kernel standard OS such as Linux, Windows and others making it vulnerable to viruses.

The high cost of equipment – to build their own cloud companies need to allocate significant financial resources, what is not favorable for a start-up and small companies.

And finally a few words about the future of cloud computing In the future cloud computing will be more accessible for consumers and businesses. This is due to several factors:
− Hardware virtualization – performance of cloud computing will be improved;
− Reduction in power consumption of hardware;
− Grows of speed – bandwidth network equipment constantly increases, which improves productivity and reduces the amount of equipment for the same channel.

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HELIUM TECHNOLOGY

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The industry of hard-drive disks tried to implement the usage of helium (gas, which is seven times lighter than air) for a long time. It was always unsuccessful because helium had a trend to leak out of whatever container it was placed inside. Such HDDs stopped working in a short term.

But HGST researchers have managed to elaborate a new type of HDD – the world's first helium hard disk, that is completely sealed.

When we use helium in a hard disk instead of air, it creates less turbulence during rotation inside disks, which means that more disks can be packaged in a smaller space. These drives also consume significantly less energy.

New six-terabyte hard drives consume 23 percent less energy and are 50 percent more powerful than usual hard drives. This is an innovation that solves only mechanical problems to improve the high-tech.

Besides "Ultrastar Helium 6" created by HGST – the first helium-filled drive, it is also the first disc which has six terabytes of storage in a standard 3.5-inch container of hard drive.

Air HDD vs. Helium HDD
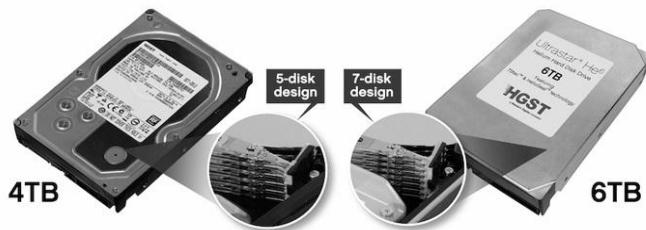
Although this kind of technology is a bit outside of the average consumer's attention, at least for now, large data centers are interested in increasing the storage capacity with the same size of device, which consumes less energy. So, they pay fairly great attention to helium discs.

Mike Cordano, the President of HGST said that one of the main targets of helium disks will be "cold storage". It means, that data, which is rarely available, must be available at any time. For example, it can be data such as old photos on VK.com – you'll keep them on the Internet, never using them or looking through them occasionally, but you still want to get access to them at any time. Previously, such data would have to be stored on tape, but it is not practical today in the Internet Age.

In addition to "cold storage", there is another advantage of helium disks. They are sealed, it also means that such hard drives are waterproof, so they are ideal for data centers which cool with the help of aqua technologies. In these centers, hard drives and servers are shipped in a non-conductive liquid that looks like mineral oil. This means that the equipment can operate at relatively high temperatures, but always be cold through the liquid.

HDD of this kind can be interesting to large data centers or companies which handle large amounts of information. It can be banks or insurance companies.

The price of the original HDD 6TB Ultrastar He6 is about 800$. So, this new technology is expensive but very perspective. Helium decreases vibrancy, abrasion and other mechanical problems which restrict the storage density of common HDDs. This gas also causes less energy expense.

I think Helium technology will put an end to air-based hard disk drives in the nearest future.

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# ELECTRONIC IRIS FOR LOW POWER AND SPACE-LIMITED DEVICES

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In the last years, the demand for small and progressive optical systems in high-tech electronics with integrated cameras, e.g., tablet computers, smartphones, and notebooks, has increased. The iris in lens of conventional cameras consists of several metal plates of a special form that overlap each other when moved. With a little bit of opening or closing the iris, the photographer controls the amount of a light that reaches the camera sensor or film surface. This mechanism is fairly effective, but it is extremely difficult to reduce it for using the iris in space-limited devices such as smartphones.

Most of the previously proposed devices are based on mechanical movement of different light-absorbing materials. There is no technology at the present time which allows creating such a tiny iris that could be integrated into the smartphone cameras. To solve this problem, a team of scientists used a "smart glass" to invent a small-sized electronic iris that can bring much higher image quality and flexibility for smartphone cameras.

The scientists, from Germany's University of Kaiserslautern, invented electronic iris using an electrochromic material. This material is composed of several layers of different polymers which are losing their transparency when a small electrical potential is applied. Each layer is formed as a ring, and together they make up the concentric structure. Consistently enabling or disabling the ring by ring you can increase or decrease the diameter of the aperture by adjusting the flow of light which passed through the iris. The circular structure allows illuminate the surface of the sensor evenly and without distortion, allowing you to make a high quality photo. In addition to the advantages above, electrochromic materials do not require the constant presence of an electric potential for supporting the material in the opaque state. Moreover, the low switching state energy of the material (approximately equal to 30 μW), allows using electronic iris in camera of smartphone with low battery capacity.
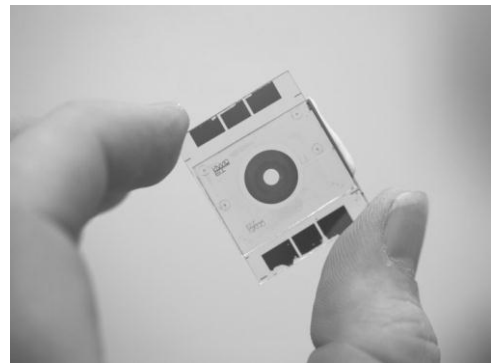
However, the electrochromic material used by scientists has one drawback - too low speed of its response. Now the material needs a few seconds to switch from a transparent state to an opaque, and the reverse transition takes three times longer. This time is not acceptable to the introduction of technology today, so the researchers are going to increase the response speed of the iris soon with a new electrochromic material on the development of which they are working.

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TYPES OF VIDEO TERMINAL ATTACKS AND WAYS OF PROTECTION AGAINST THEM
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To start with it is necessary to define what is the video terminal. Video terminal is the device for remote input or output of information in computing systems. The main components of video terminal are the video controller, the display and the input equipment.

One of the elementary attacks to video terminal is the attack using optical vulnerability of the terminal namely that the video terminal displays information on the screen to which it is impossible to limit access. The malefactor easily receives information on watch facilities behind the video terminal.

For protection against optical leak use any technologies. The first of them is a special film, which is pasted on the display and reduces a view angle. The second technology is program, which consists of contrast changes of the image [1].

Also, information can be removed from the video terminal on means of interception Van Eyka [2].

Van Eyk's interception is the process of contents interception of the ELT-monitor screen by detection of the electromagnetic waves extended by it. He received such name after the Dutch computer researcher Wim van Eyk (Wim van Eck) who was the first to publish article including research for verification of the concept in 1985.

In 2004 Markus Kuhn (English Markus Kuhn) carried out van Eyk's interception for LCD monitors.

It is possible to protect the video terminal from van Eyk's interception in two ways: passive and active [3]. The passive way consists of the use of the special screen constructions, which reduce the power of dangerous signals (PEMIN signals) on border of the controlled zone.

The second way of protection is active, in this methodwe use noise generators, which generate noise to reduce a signal to noise ratio on the border of the controlled zone.

For protection of the video terminal it is better to use the combined method in which means of protection as well as from optical leak and from van Eyk's interception are used.

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THE BEST CLI FRAMEWORK IN PHP
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PHP is a widely used programming language, which has worked well for web development. It is a scripting language that supports multiple paradigms.

It is very fast and incredibly flexible general-purpose language that will satisfy the needs of any programmer.

This language is popular for many years because it has very friendly community and large number of ready solutions.

PHP Command-line interface was first released in PHP 4.2 (only as experimental). But now it is fully supported as default. CLI is just a new SAPI type that focused on programming console app with PHP. It should be noted that the CLI and CGI are different SAPI, but they share many of the same characteristics.

Why do we use a PHP CLI? First you want to use PHP Command-line interface, simply because there are some advantages in the ability to execute PHP from the terminal, such as:
− no need to learn other console language;
− execute scheduled script;
− create GUI tools as wrapper;
− re-usage existing code;
− write a very productive code for your project, using multi-threading potential of PHP5;
− touch to standard streams in PHP.

To speed up the development process commonly uses existing software solutions such as some libraries or frameworks. The most popular ones are listed below.

Php-cli-tools – a big collection of tools to help with PHP command line utilities. It was made by development team of wp-cli project. It includes a variety of methods of data processing and data visualization.

CLImate − PHP's better tools for console app. CLImate allows you to easily output colored text, special formatting, and more. It makes output to the terminal clearer and debugging a lot simpler.

Clinner − command execution abstraction for PHP. With this tool, you can easily use the operating system commands or other command line application. You can use and process the execution results of the other programs for your purposes.

Zf− a micro PHP framework for both web and CLI. This library is designed to create routes, and provides a good instruments to process input data in a different form.

These libraries were chosen because they have not complex dependencies and they are not the part of another framework. The set of these tools helps you quickly and without any problems implement all necessary functionality. Now you can do everything you like with PHP CLI!

You can't choose just one best of the best framework for developing CLI applications, because each of them separately is not the best solution for a particular problem. You will always need to use a few libraries to provide optimal solving problems.

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ASYMPTOTIC ANALYSIS AND THE COMPLEXITY OF ALGORITHMS
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Analysis of algorithms is caused by several important reasons. One of the reasons is the necessity to obtain estimates or bounds for the amount of memory or run time, which is required for successful processing the algorithm of specific data.

There are a lot of different algorithms for most problems. Which one to choose for a concrete task? This question is very carefully studied. An effectiveness of the program is a very important characteristic of the code. Users always prefers more efficient solutions even in cases where efficiency isn't critical.

The computational complexity of the algorithm is the amount of elementary operations, which an algorithm performed for solution to the problem. The complexity depends on the dimension of the input data and on the type of data. Obviously, the more complicated the algorithm computationally is, the more computer resources its execution require.

There are two components of the effectiveness of the program: space and time. Accordingly there is time and space (spatial) complexity. Time complexity determines the time required for the solution of a set dimension with the help of this algorithm, and the space complexity determines the number of required resources (memory) under the same conditions.

Previously, the memory has been the dominant factor in assessing the effectiveness of the code, because computers have limited memory. When implementing identical features by several programs, the code which uses less memory has a greater spatial efficiency. But in recent years in connection with cheaper memory this component of efficiency began to lose its meaning.

If you want to compare the efficiency of algorithms, the best way to do it is to calculate their order of complexity. This approach is applicable both to temporal and spatial complexity. The order of complexity expresses its effectiveness through the quantity of data processed.

In his works Knuth has proposed the next approach for the algorithm analysis: total execution time is the sum of the weight of the cost * frequency for each basic operation. The number of basic operations may include addition, multiplication, division, obtaining the index of the element of the array, comparing integers etc.

Alan Tyuring said that it is convenient to use even rough approximations estimates the execution time: one may assign weights to various operations, depending on their frequency of occurrence at the time of the algorithm, and consider only those operations that correspond to the highest weight. Consideration of only the most common operations is the first simplification proposed for the approximate computation of the algorithms.

The second simplification is dropping terms (i.e. summands) of a lower order, which contributes little to the final evaluation of the algorithm execution time.

To evaluate the effectiveness of the algorithms it is used the function "O". $O(g(n))$ is the complexity of the algorithm if the increase in the dimension of the input n, the running time is increased at the same rate as the function $g(n)$.

O-complexity analysis is widely used in many practical applications. However, you must clearly understand its limitations.

The main disadvantages of the approach include:

1. obtaining O-count for complex algorithms is usually either a very time-consuming, or virtually impossible,
2. O-assessment is too coarse to show more subtle differences of algorithms,
3. O-analysis gives too little information (or does not give it) to analyse the behaviour of the algorithms in the processing of not large volumes of data.

It is very important to be able to analyse algorithms and determine their complexity. The time complexity of the algorithm can be determined after the analysis of its control structures. The complexity of the algorithm is just a way to measure formally how quickly a program or algorithm works.

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DIE GRAMMATISCHEN ASPEKTE DER GESELLSCHAFTSPOLITISCHEN VIDEOREPORTAGEN

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Das vorliegende Forschungsprojekt, das im Rahmen der Jahresarbeit durchgeführt wurde, untersuchte die grammatischen Aspekte der gesellschaftspolitischen Videoreportagen. Die Forschungsarbeit zielte ab, die grammatischen Aspekte in den Texten der gesellschaftspolitischen Videoreportagen zu bestimmen und zu analysieren. Um das Ziel der Forschungsarbeit zu erreichen, sollten:

− die gesellschaftspolitischen Texte als eine Textsorte beschrieben werden;

− die Texte der Videoreportagen hinsichtlich der Besonderheiten ihrer grammatischen Aspekte analysiert werden;

− die grammatischen Aspekte in den Texten der Reportagen erfasst und untersucht;

− die grammatischen Aspekte der gesellschaftspolitischen Videoreportagen systematisiert.

Als Forschungsmaterial wurden die deutschsprachigen Videoreportagen aus verschiedenen Fernsehnachrichten vom Media-Center "Deutsche Welle" ausgewählt. Das Forschungsmaterial betrug 20 Videoreportagen, die sich durch eine Vielfalt an Themenbereichen und Präsentationsformen unterscheiden.

In der Forschungsarbeit wurden folgende Untersuchungsmethoden angewendet: die Methode der Textanalyse, die Methode der Verallgemeinerung und die mathematische Methode.

Die Definition des Begriffs "Text" von Galperin wurde der vorliegenden Untersuchung zu gesellschaftspolitischen Texten zugrunde gelegt.

Die gesellschaftspolitische Reportage gehört zu dem journalistischen Genre, das die operative anschauliche Vorstellung eines Ereignisses durch die Weltanschauung des Autors, seiner Teilnehmer oder Augenzeugen liefert [1; S. 142].

Der richtig geschriebene Text der Videoreportage soll beim Zuschauer «den Effekt der Anwesenheit» und «den Effekt der Teilnahme» herbeirufen [2].

Die Ergebnisse der geleisteten Arbeit haben gezeigt, dass sich die gesellschaftspolitische Videoreportage als eine Textsorte von den Texten anderer Stile durch die grammatischen Besonderheiten unterscheidet:

− in allen Texten der Videoreportagen ist die Verwendung von Präsens unter den Zeitformen vorherrschend;

− passiv wird ziemlich selten gegenüber dem Indikativ angewendet;

− die Texte der Videoreportagen sind hauptsächlich in einfachen Aussagesätzen mit invertierter Wortfolge gefasst.

Für eine erfolgreiche Übersetzung von diesen Texten muss man die grundlegenden grammatischen Funktionen von Texten der Videoreportage, die Struktur, den Aufbau und die Elemente der gesellschaftspolitischen Texte kennen. Die Übersetzung von Texten dieser Art erfordert ein ausreichendes Hintergrundwissen, um die in den Videoreportagen enthaltenen Informationen zu verstehen und wiedergeben zu können. Bei der Übersetzung muss man auch auf die emotionsgefärbten und expressiven Besonderheiten der Sprache achten, vor allem darauf, mit welchen grammatischen und syntaktischen Kategorien sie ausgedrückt werden. Diese Besonderheiten helfen, den inneren Zustand des Autors und seinen Bezug zum Thema besser zu verstehen. Aus den oben genannten Gründen ist die Untersuchung der Besonderheiten der gesellschaftspolitischen Texte für die Übersetzungswissenschaft eine der relevantesten Fragen.

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PROJECT ARA (MODULAR SMARTPHONE)

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Project Ara was announced in October 2013. The unit is developed based on ideas proposed by Dutch designer Dave Hakkens. Initially, the group of developers was part of Motorola, but after the sale of a Chinese manufacturer Lenovo they became subservient to Google. Now this group is led by DARPA former Regina Dugan.

Why this project is so important for us? The answer is in modular smartphone structure. You do not need to throw out a smartphone if you want to purchase a new one. All you have to do is buy a new module. You will get more powerful or more functional device.

We can expect first working prototype of Project Ara in early 2015. After that, as Google says, it will enter market and everyone will have an opportunity to buy such smartphone.

However, you can already find out lots of preview videos or developers logs.

The main part of modular smartphone is aluminum "endoskeleton". Google plans to sell it for $50. You are able to put Wi-Fi module and battery; blocks with telephone module, GPS, cameras, and other modules in "endoskeleton". However, you will need to purchase

these blocks separately and insert them into "endoskeleton". The thickness of each unit is about 4 millimeters, and the total thickness of the device is 9.7 millimeters. So, physical parameters are comparable to all recently developed smartphones.

In addition, Google plans to provide three sizes of modular smartphone: small, medium and large. Large size is comparable to the phablets. The bigger size of "skeleton" is, the more modules you can connect to it. Thus, the average base includes slots for attachment of ten modules.

After the market entering Google will sell modules for Project Ara in its own shop. Moreover, Project Ara software platform will served with recently developed OS Android L.

Smartphone modules are connected to the "endoskeleton" using a protocol UniPro, developed by Alliance MIPI. So we can expect supporting "hot swapping" function. This means that to remove a plug-in and install a new one on the same place you don't need to reboot the smartphone. However, if you have to put the new processor, the rebooting is necessary.

There is a good idea to make modular smartphone widely spread. Google wants sided developers to create different modules for Project Ara. In such way Google hopes to develop phone "ecosystem" by opening the possibility of creating modules for all who wants to suggest own modules.

You will be able to buy new modules at the special store components for Project Ara. It will be opened soon after the phone release. How will it work? It's going to be very similarly to Google Play Store. The catalog is opened, and all modules that are loaded into the directory will also be open. Any developer, who created his own module, after the Google approval, will be able to offer such a component to customers through a centralized directory from Google.

So, we can just wait till Project Ara will be released and free to purchase. It's really big step in developing environmentally-friendly devices. No need to "store" smartphones that are getting older so fast. Just buy a new module you need to update and go on!

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TEST DRIVEN DEVELOPMENT WITH PYTHON

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Test-driven development (TDD) is a software development process based on short development iterations. An iteration starts with writing tests that determines improvements or new features of a product. The goal of iteration is to write code that will pass these tests. Then you should refactor the program. The process is repeated until all product features are implemented.

You should consider many various situations when you are writing tests. Unit testing helps to verify complicated program logic and test after adding new functions. Unit tests are considerable because it provides high quality of code, integration with build and CI tools, code documentation and regression testing.

Good tests are fast, so it don't take much time to ensure that the system is still working after adding a new feature or fixing a bug. They also are clear and easy to understand that makes code easy to support. Unit tests should be isolated so one test doesn't affect any other tests. Good tests are also reliable so passing all tests guarantees that the system works properly.

There are many frameworks that can be used for TDD. Let's take a look at some of them. Good framework should provide ease of creating and using tests, running a specific test, running all failed tests, have a support of xUnit output, turning tests into documentation, parallel testing and interactive debug. Also convenient framework should support such features as test autodiscovery, setup and teardown, code coverage and code profiling.

Unittest is almost identical with common frameworks for the most popular programming languages. It is included in standard python library and provides the best IDE support. On the other hand, it is inflexible, it hasn't test autodiscovery, doesn't allow to run a specific test and don't support progressive functionality.

The other testing framework is py.test. It supports extensions and provides test autodiscovery. It's simple to create and use tests with py.test. It also has a support of many progressive features – testing with parameters, parallel testing, code coverage, interactive debug. It is also compatible with unittests. It's disadvantages are that it is not standard and isn't supported by IDEs.

Nose supports unittests and all progressive functions, works fine with Django, Pylons and Turbogears, has perfect support of addons, and some IDEs support it. It is a very popular framework. It's only disadvantage is that it is not standard.

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3D PRINTING

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How often do we hear about scientists and medics, who created an artificial hand with robotics, which helps a person to save at least a bit of a human hand's functions? But still it's so expensive! If you had some calculations on why it costs so much, you'll see, that the main reason is the uniqueness of the parts needed.

Another commonly known problem is the costliness of manufacturing, for example, of planes. The complexity of creating the details according to the plans can cost more than the materials for them.

Could you imagine a 3D project of some plane's element just printed in a 3 dimensional form? Could you imagine a human's body part made of his own cells? Could

you imagine your apartment furnished with completely unique stuff made by yours imagination?

3D printers have already brought all these to life. It is a perfect solution for design patterns, architectural concepts, and products needed in the field of education, the arts, medicine and cartography, etc. 3D method is really effective and quick, can produce forms of great complexity in a big variety of forms using different types of materials, same as used in the manufacturing now.

Such printers can 'print' in big variety of materials including: metal, plastic, nylon. It can be used for creating prototypes, user's own creations, medical plasters to fix a broken limb, parts of a spaceship. Besides it can print senseless tiny models like the dummy of a Darth Vader.

3D printing itself is a process of making things, but how it works? First of all you have to get a printer and the materials for printing. Secondly you need software for creating 3d models. Nowadays there are plenty programs for such purposes like 3dMax. The last but not the least you have to install a driver for your computer to work properly with the printer. After it's correctly detected, you do can press 'print' button. At this very moment your program starts turning it into binary form and sending it to the printing head's controller. So, in an hour or two you'll get your own Master of the Universe in a form of a pendant.

Sure, we can say that with the use of 3D-technology modern art is going through a new stage in its development. The emergence of 3D printers was a real find for representatives of different spheres of human activity.

The essence of the 3D-printer is to create the many layers of material volumetric three-dimensional model, designed on a computer or obtained by scanning a real object. The material can be plastic, gypsum, or even soft metal seems to be aluminum or copper. By analogy with conventional printers in modern 3D-printing technology devices are divided into laser and inkjet.

Inkjet 3D-printer nozzle squeezes out a certain amount of heated plastic or similar material on the cooled platform. Drops quickly congeal, forming one of the layers of the three-dimensional model of the future. In laser 3D-printers or laser illuminates a liquid photopolymer, causing it to harden or rather burn in the material contours of the future details.

Today in the world there are following major technology 3D-printing:
− Print the molten material (layering of molten material, FDM (plastics, edible substances, organics));
− Layer bonding powder (polymer, plaster), 3DP - you can print full-color model;
− Spraying a photosensitive polymer followed by hardening it by ultraviolet PolyJet;
− Photopolymer printing SLA;
− Sintering powders (polymers, ceramics, metals), SLS, DMLS.

That is, the establishment of different things requires different techniques and using different materials. With the active introduction of 3D-technology in mass production began to be replaced before the usual materials: for example, composite materials of carbon fiber now replace steel and aluminum in mountain biking and airliners.

In theory, 3D-printers can reproduce everything that we have today. And one of the negative consequences of this is the possibility of 3D-printers to print draw near revolvers, rifles and machine guns. Create a firearm can be by downloading the virtual 3D-model of the web. And it is extremely difficult to prohibit or limit access to such schemes in the World Wide Web.

It is believed that in the near time 3D printing will be the basic technology of making any of the items either in home or in an industrial scale. Printing on these printers is carried out mainly using plastic, but basically for making bulk items, you can use any material, for example metal or chocolate.

In the future, 3D-printers allow people to create any object by simply pressing a button. Many consider it fiction with science fiction, but 3D-printers exist in reality for 25 years, and recently they have rapidly improved and cheaper, going beyond laboratories and specialized industries for a wide market.

This area allows you to make the impossible possible and open up new opportunities for people around the world.

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MPLS-TP

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Now a lot of transport systems use MPLS. Most of core routers support MPLS capabilities. This technology uses short fixed-length label for forwarding. Moreover, the greatest advantage of MPLS is that it can support the most popular services such as L2VPN, L3VPN, TDM [1].

In due time, the Internet Engineering Task Force (IETF) began defining MPLS Transport Profile for using it in transport networks. As the result of their work MPLS-T had been developed. But it was not ideal. Therefore, development of the standard MPLS-TP was initiated with the following improvements over MPLS:

− It will not include a centralized NMS, moreover it will ensure the independence of management level;
− OAM support and switching protection at the data level;
− forwarding is based on MPLS, PHP labels and ECMP are not used;
− OAM functions should be performed by ACH channel.

Standardization work of MPLS-TP began in the first half of 2008. It is conducted under the auspices of the Joint Working Group MPLS-TP formed by IETF and ITU-T. A lot of manufacturers of equipment for transport networks are its members. This is one of the most active groups in IETF.

According to the majority of its members, MPLS-TP should have functions similar to those existing transport technologies. It must consist of effective OAM, good protection and centralized management, etc. However, many mechanisms are not described yet.

Competition between transport technologies based on MPLS and Ethernet, similar to drama. It can be traced even before 2005. Initially transport technologies Ethernet, especially PBB-TE, were well received by the market. While more than a dozen vendors expressed their support for PBB-TE. In 2005-2007 its implementation was held in some networks. However, starting from 2008, several operators begun disclaiming RVV-TE. MPLS-TP was supported by the majority of operators, so now this technology can be considered to be the winner. A side effect is a significant enhancement of routers in the telecommunications market, as data are transmitted in carrier networks through routers.

From a technical point of view, MPLS-TP as compared to Ethernet technology has the following advantages:
− MPLS-TP support can be seamlessly integrated into modern routers;
− technology derives from the possibility of MPLS quasi wire access and therefore provides full support services such as E1, STM, Fibre Channel, ATM, etc.;
− inherited L3VPN support from the MPLS technology [2].

With MPLS-TP, network provisioning can be achieved via the centralized Network Management System (NMS) and/or a distributed control plane. The Generalized Multiprotocol Label Switching (GMPLS) can be used as a control plane that provides a common approach for management and control of multilayer transport networks [2].

In fact, Ethernet-based transport has its advantages: the possibility of combining technology-oriented and connection-oriented, thereby providing support for connections such as 'a lot of points - a lot of points.' Furthermore, the process of standardization is the final stage, unlike MPLS-TP. However, the market has the last word on this subject. It is wrong to say that transport Ethernet network is being displaced from the market. For example, Ethernet ring protection mechanism is still in demand by many operators.

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AUTOMATIC OPTIMIZATION FOR CUDA PROGRAMMING

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Today, there are many scientific fields where complex computation problems exist. These problems require large amount of computation resources. Fortunately, many of them may utilize modern graphic processing units (GPU). So far, GPU was used only for compute graphics, but usage of these devices has changed over last decade. Programmers started to use GPU for common computation objectives. This technology is called General-purpose computing on graphics processing units (GPGPU). Started as home-grown methods to use graphics library in irregular way it led to appearance technologies like CUDA and OpenCL.

CUDA technology is parallel computing platform constructed by NVIDIA. Using it software developer can utilize NVIDIA's GPUs to common computation goals. CUDA gives program developers admission to the memory and command set of the streaming microprocessors (SM). CUDA platform has become a standard model for GPGPU technology. Though, CUDA force developer to package GPU code in particular methods, apparently control data transmission between the host storage and GPU memory, and then optimize the using of complex GPU storage hierarchy. Production usage shows that developers need to make considerable program modifications, which are frequently non-obvious and fallible, until obtaining an optimized program that able to utilize potential GPU performance.

To cope with manual optimization complexity several automatic approaches is appeared: CUDA-lite tool[1], hiCUDA language [2]. Also there is an algorithm of automatic optimization for CUDA technology in [3].

First project we should to look at is CUDA-lite. It's an experimental expansion to CUDA that provides for developers to utilize alone global GPU memory ignoring complex storage hierarchy. To increase the efficacy, the specialists have to utilize annotations describing properties of the data structures and code areas denoted to performance on GPU chip. The CUDA-lite tools methodically examine the annotations and define if the storage bandwidth may be kept and latency can be diminished by using some particular storage types and/or by manipulating memory access patterns. To implement it CUDA-lite executes the necessary converting and code insertions. So, CUDA-lite tool represent a source-to-source translator. CUDA code accompanied by CUDA-lite annotations is an input to translator. Translator's output is a clean CUDA code. CUDA-lite finally targets numerous forms and generations of data-parallel execution chips. The developer may choose to rewrite some kernels manually, despite the highest performance is obtained.

Another interesting project which helps to cope with CUDA programming complexity is hiCuda. hiCuda is a special language extension gives to a developer new generalization to get maximum efficiency in an ordinary way. With the directives of hiCUDA developer can research various types of processing the GPU memory matching and retrieving GPU calculation, and of processing the GPU memory. Project staff has realized a translator that transform a hiCUDA code to the same code on clear CUDA language. Five sample CUDA standards present that utilizing hiCUDA directives technique prevent costs to execution period. The efficiency of produced hiCUDA compiler code ranges in 2% of that optimized CUDA version by hand.

The engineers and authors of paper [3] as well introduced a method that based on the idea of transforming loops into a CUDA kernel, which are optimized. This algorithm consists of 3 steps:

1. loop tiling;
2. coalesced memory access;
3. assert optimization.

The GPU parameters for presented algorithm: the storage usage (global GPU storage and shared block storage), quantity of blocks per SM, and quantity of threads in each block. In complement method tries to maximize utilizing of the GPU asserts. Authors also offers an algorithm for figuring out possible tiling configuration with coalesced memory access that best fulfills given problem. Storage optimizations should lead to decrease latency of memory access for each thread in block to utilize maximum potential of GPU chip.

There are many experts all over the world which uses CUDA for solving their problems in mathematics, cryptography, biology, physics, and computer science. Solution of these problems needs a lot of computational resources, so performance of appropriate programs is critical. Described above methods, help us to automate optimization of CUDA kernels. First of all, it saves expensive developer's time. Secondly, formal approach may deal with various difficult cases that are too difficult to cope with manually. Unfortunately, major approaches still need enhancements: on the one hand to provide more aggressive optimization techniques, on the other hand to provide simpler interface.

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PROGRAMMING LINUX SERIAL PORT MODULE AS BETTER OPTION COMPARING TO WINDOWS DRIVER MODEL

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Young minds may face some difficulties trying to remember information or gain some useful skills for developing their own simple operating system during the System Engineering course. Thus, we can get information from Internet resources but unfortunately, sometimes it is hard to understand it properly as there is no explanation and actually the teachers' explanation is also quite confusing. The problem seems to be rather simple as teachers start their educational course with presentation of old Windows versions and DOS-based system architecture, while the easier solution for getting practical skills can be found in Linux systems.

The course of System Engineering gives the understanding that on basic level computer can directly interact with other computers through serial port connection as it has many advantages comparing to complicated ports such as parallel port of printers or USB-port. In comparison with Windows operating system, Linux has understandable modules structure. Windows has some specific Windows Driver Model, which requires some specific knowledge and instructions for device drivers development. It claims that you need not only to declare main entry point and exit point from your driver but also declare functional for power management, PnP (Plug and Play) options and at some point for direct access memory code.

```
#include <linux/kernel.h>
#include <linux/module.h>
#include <linux/init.h>

int stud_serial_init(void);
void stud_serial_cleanup(void);
static int stud_serial_open(...);
static int stud_serial_release(...);
static ssize_t stud_serial_read(...);
static ssize_t stud_serial_write(...);
static void setup_stud_serial(void);
static void checkRegState(void);


   . . .


init_module(stud_serial_init);
cleanup_module(stud_serial_cleanup);
```

Figure 1

As a result, many students have no proper knowledge about serial port connection. Let us look at the code itself (see Fig. 1). Language of Linux module development is C. All you need to know is that serial port is asynchronous port and there is no need to worry about system interruptions at the first stage of development. The whole module code file can take up to three hundred lines of code, which is quite a small number for device driver. As to serial port the basic set of actions are opening the port, allocating memory for address space of port registers and checking state of registers that we can use: TxD and RxD, which stand for Transmitted Data and for Received Data. When we are done with data processing through the port we need to clean up everything used by our device: it means we need free allocated memory in the system and clean the device tree.

Therefore, as you can see, code structure of this module is not so complicated. It looks like simple program, but comparing to any C language program, instead of "main" method it uses "init_module" method as entry point. Next step is to compile the code and

insert compiled module to Linux kernel. Linux kernel development can increase understanding of system architecture by its module system simplicity. Future research can give us opportunity to gain specific skills for driver development and automatization of modules development process.

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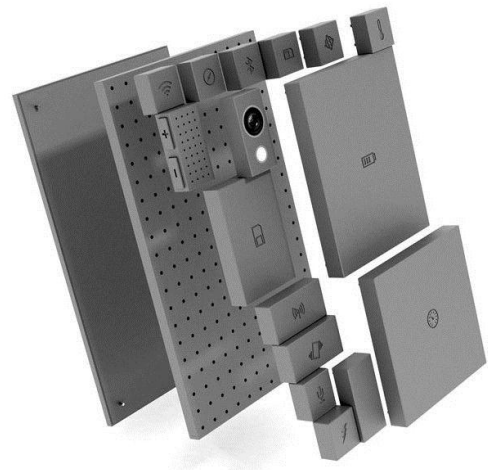2. Jonathan Corbet, Alessandro Rubini, and Greg Kroah-Hartman (2005).*Linux Device Drivers*. 3rd ed. USA: O'Reilly Media. p1-4, p565-573.

PHONEBLOKS

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In a way, current phones are disposable. We always throw away millions of our electronic devices, because they become wear out and get old. However, usually it is only one of the part of this problem. The other devices work fine but is simple thrown away. As soon as a new model comes out, the old model is tossed in the garbage or put on the ledge to gather debris. That is because our gadgets were not designed for a long period of exploitation. That is why electronic waste is one of the fastest growing waste streams in the world. Moreover, our phone is one of the biggest causes. Therefore, the way people currently buy electronics is inherently wasteful.

So, this is a new kind of smartphone. Phonebloks is a modular smartphone. It consists of replaceable blocks. It can be modified like your computer to your own preference. There is no use buying new model for the best details, you can upgrade your smartphone just as your desktop computer. Phonebloks is made of the blocks that can be detached. It would give you the ability to make a phone truly yours. There would be one block for the camera lens, one for the battery, and one for storage and so on. All blocks are connected to the base which connects them together and looks like analogue of the motherboard in the desktop computer. Electrical signals are transferred through the several pins, and two screws that lock every block in its place. So if your phone became a little slow, or something else, you can simply upgrade the needful block. On the other hand, if some detail breaks you can always replace it with a new, or even update it with the new version. This is a main idea of the Phonebloks and for the modular smartphones in general. For example, if you do everything in the cloud service, it will be grate to replace your battery block for a bigger storage block, or upgrade your speaker, or even get a better camera. You can choose the blocks from brands that you like, or develop your own. Moreover, Phonebloks is built on an open platform by companies working together to create the best phone in the world.

However, some technical barriers prevent Phonebloks from release. Because all blocks are outside of the main board, signals have to travel much longer between the different parts of Phonebloks. This extra distance create noticeable delays between reactions of elements. To develop a system to allow the user to place arbitrarily blocks, unlike expensive pins and sockets, would be very difficult. The device based on the block system

probably can be thicker than today's smartphones because of the base, that connects all blocks and screen into an organic whole, and blocks would be at danger of dislodging from the main board.

Phonebloks and Google corp. cooperate to accelerate the emergence of modular smartphones. Smartphones based on the Phonebloks system will be sold in components, as well as in full sets. When a gadget assembled, the phone would have all parts of the modern smartphones in usual places: screen covering all front part, volume buttons and headphone jacks along the outer edge, and only on unusual part of this smartphone – blocks, will be attached to the back of the smartphone, forming a rectangular block.

Phonebloks in prospect is a phone that people can keep and use for a long time; it is the expected evolution of modern smartphones.

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VIDEO PROCESSOR MICROPROCESSOR CONTROL SYSTEM

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One of the main problems of X-ray television control methods is the fact that the operator of X-ray television unit must solve the problem on the selection of the dose of X-rays, selection of exposure time, etc. It takes a lot of time and makes its own errors because the operator subjectively assesses the required parameters of X-ray television system. Therefore, the problem arises in improving the product quality control efficiency and reducing of errors made by the operator. This problem can be solved by applying the digital methods of signal processing in X-ray television systems. These methods are implemented in the video processor VP-063. The input signal is amplified, digitized, processed, cleaned, normalized and stored electronically with the help of video processor. It has the advantages in the fact that it is mobile and can be easily inserted into any existing X-ray television system. And the main thing is that it uses microprocessor control system to control signals processing. It implements automation of quality control process, and the microprocessor selects the desired exposure time and generates control signals for video processor.

To define the type of microprocessor that will be suitable for these tasks, the following requirements need to be taken into account:
− the microprocessor should fully satisfy the needs of video processor in the speed or operation of signal processing;
− the microprocessor should have the correct number of ports for connection and interoperability of functional blocks;
− the microprocessor should have relatively low cost.

Atmel microprocessor of ATmega640 type fully meets these requirements, therefore, it is used in the given system.

Microprocessor control system performs extremely important functions in automation of X-ray television control technology, namely:
− video processor selection control of exposure time;

- control of automatic amplification of signal;
- control of signal digitization.

Microprocessor system analyzes the frames received by video processor in the real-time scale and manages the timing of exposure. The equally important function is the analysis of signal level and its automatic amplification. This function is performed to coordinate the dynamic range of signal and the ADC. After analysis of signal, microprocessor control system automatically binds the black level to the lower boundary of dynamic range of the ADC, and the white level - to the upper boundary. At the presence of a constant component in the signal, microprocessor removes it in order to add in the dynamic range of the ADC exactly the information component, i.e., the input signal is extended over the whole dynamic range of the ADC.

Microprocessor control system also performs functions that significantly extend the functionality of the video processor:

- keyboard and indicator control;
- USB-port control for connection of video processor with the computer;
- support functions of read/write of information to the flash memory;
- making a file system for storing and archiving of radiographs for their further transmission or reproduction on the indicating device.

Consequently, we can conclude that the use of microprocessor control system in the video processor allows partially automate the process of control, quickly performing the routine work of the operator for setting and adjusting the parameters of X-ray television unit settings by pressing only one button on the keyboard. Also, the productivity of X-ray television control technology significantly increases, while the expenses of costs and time for processing, registration of radiographs are considerably reduced.

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SMART HOUSE

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A *smart house* is a house that has highly advanced automatic systems for lighting, temperature control, multimedia, security, window and door operations, and many other functions. A smart home appears 'intelligent' because its computer systems can monitor so many aspects of daily living. For example, the refrigerator may be able to inventory its contents, suggest menus, recommend healthy alternatives, and order groceries. The smart home systems might even take care of cleaning the cat's litter box and watering the plants. The idea of a smart home may sound like something out of Hollywood. In fact, a 1999 Disney movie titled *Smart House* presents the comical antics of an American family that

wins a 'house of the future' with an android maid who causes havoc. Other films show a sci-fi vision of smart home technology that seems improbable.

Right now, "smart home" technology is available off the shelf; home automation enthusiasts have access to all kinds of gadgets that can make life simpler − and more complicated. The key goal for home automation is to give the occupant total control over the house from anywhere. Most home automation devices require a central personal computer to provide control and to run programs. For instance, X10 modules plug into the wall and then communicate with a home computer, letting a person turn on and off lights and appliances via a Web site. There are quite a few *sensors*, such as cameras, motion detectors or water leak detectors, that can be used to monitor who is in your driveway, trigger exterior lights when people approach or constantly check for broken water pipes. Meanwhile, *effectors* can be used to automatically water plants, remotely raise and lower blinds, or feed your pets. Anyone can create the ultimate remote-control house − the only limit is your wallet.
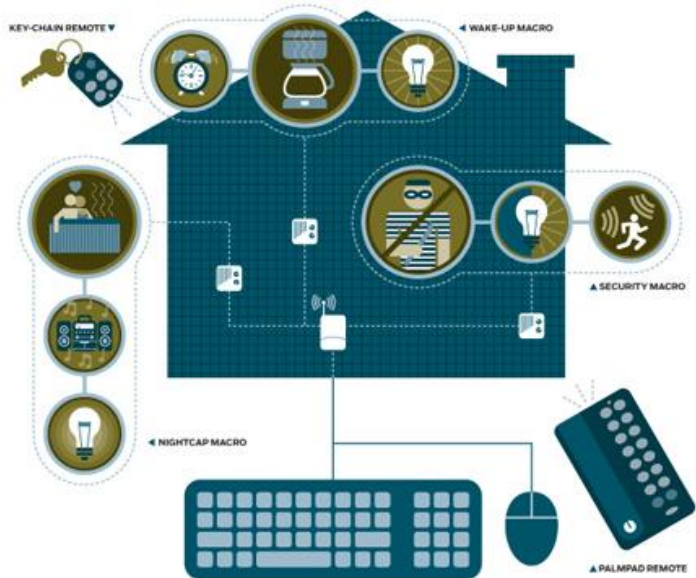
The most promising application is to help elderly people live safely and independently. According to census data, within two decades the age demographic of the United States will be the same as the age demographic in Florida today. Smart homes are being designed to use simple sensors common to home security systems and advanced artificial intelligence in order to figure out what people are doing (*activity recognition*) and where they are at (*location estimation*).

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AUTHENTICATION PROTOCOLS
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The use of computer networks in modern life cannot be overestimated. Even average user encounters the need of some sort of security protocols in his life. For this purpose multiple scientists around the world developed special authentication protocols, which allow several parties to ensure each other that they are the ones who they call themselves. These protocols ensure that impostor cannot intrude into data transfer and read, change or remove that data.

The most basic authentication protocol allows two parties to identify each other using the fact that they both know the same encryption key K_{AB} [1]. Let's say we have two parties, one being Alice and the second being Bob. Alice and Bob both know K_{AB}, but they want to be sure they talk to each other. Alice could simply send K_{AB} to Bob, he could check

it, and if it matched his own K_{AB}, that would mean he's talking to the real Alice. However, impostor can catch this message, and then he will know the secret encryption key of these two parties, making their communication unsafe. So they should use another way: first, Alice sends Bob her identification data (A). Bob reads it and sends back a random big number R_B. Alice then uses her encryption key to encrypt this number and send it back to Bob ($K_{AB}(R_B)$), while also sending her own big random number (R_A). Bob replies with encrypted random number of Alice ($K_{AB}(R_A)$). This algorithm is shown on the picture below.
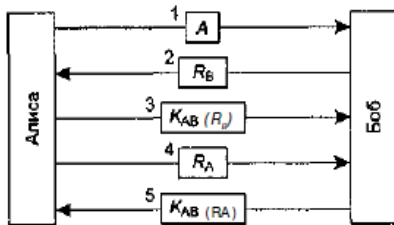
Both Alice and Bob will decrypt the messages and check if the encrypted number matches the one sent by them. Impostor cannot know the encryption key, so he cannot encrypt the number that one party sent to another, and cannot send it back. He cannot use previously caught encrypted message as well, because the random number is very big, and it is very unlikely that encrypted message will contain the same number. However, there's still one way for impostor to sneak in called SLR attack. It uses the fact that the basic protocol allows several sessions to occur at the same time.

Let's say impostor impersonating Alice sends Bob her identification data (A) with random big number R_T. Bob replies with encrypted number of impostor ($K_{AB}(R_T)$) and hi own random number R_B. After that impostor starts a second session by sending to Bob Alice's identification data again, but this time followed by the random number of Bob (R_B). Bob sends back his own number encrypted with secret key. Impostor goes back to the first
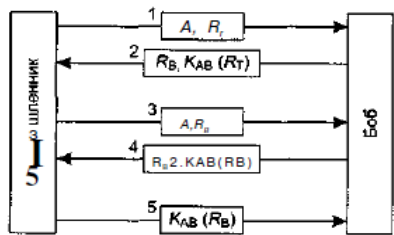
session and sends the reply, which he has just got from Bob. Now Bob thinks that he's talking to Alice in the first session, while the second session can be simply interrupted. This algorithm is displayed on the picture below.

As you can see, certain authentication protocols that seem safe at the first look can be unprotected to certain attack algorithms. For that purpose, we can define several rules of forming authentication protocols [2]:

1) Session initiator should confirm his identity before the replier does. This way impostor cannot access important data before he confirms his identity.

2) It's important to use separate keys for initiator and replier.

3) Initiator and replier should select their random number from different sets (for example, initiator uses even numbers, while answerer – uneven).

4) Protocol must be able to resist attacks, which use second, parallel session containing data from first session.

There are multiple authentication protocols matching these rules: Kerberos, Needham-Schroeder protocol and so on [3]. These protocols are considered somewhat safe from impostors if you're using cryptographically strong encryption.

Thereby we can conclude that authentication protocols are important to ensure that each party knows who it's communicating with. Protocols may contain unobvious weaknesses, that is why it's so important to develop new protocols, resistant to discovered attack types.

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HTML5 VIDEO PLAYER
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Video content is already firmly established in the world of the Internet and it is difficult to imagine a global network without it. However, the technology of embedding video in hypertext documents over time have been a certain evolution from RealPlayer to QuickTime and Adobe Flash, and is currently up to the built-in video support in HTML5. Nevertheless, all this time, various implementations of video players suffered from different cross-platform and cross-browser problems, and low or even zero level of accessibility. And if the ways of dealing with the first group of problems in general are clear and there are ready-made solutions, in case of video there is the problem of accessibility and understanding for the majority of web-developers. However, fortunately, there was a ready-made solution to the second problem, and so that everyone will be able to provide users with available video player, without deep knowledge in web accessibility.

For embedding video into a webpage HTML5 provides a <video> tag element. Even the standard implementation of the embedded video already has the basic availability and even allows you to attach subtitles. Your video may have any container format or video and audio codecs. But in this case you must be aware about support of used codecs and containers in different browsers.

Support of video containers generally handled well in all modern browsers, unless you refer to those Internet Explorer 8. Let's look at existing restrictions more particularly.

Theora video with Vorbis audio in an Ogg container supported by almost all modern browsers: Firefox 3.5+, Opera 10.5+, Chrome 3.0+. In recent years these browsers also received WebM video support. However, such browsers as Safari and Internet Explorer didn't have HTML5 video support at all. Popular mobile phones like with iOS or Android operation systems support H.264 video and AAC audio in a MP4 container.

The developers note some inconsistency of support for WebVTT in the latest versions of PC browsers. Chrome behaves more or less well, but the Internet Explorer 11, Safari 7 and Firefox 31 have problems in working with subtitles, though in Safari 6 and Firefox 30 had no such problems. It is not strange, but for subtitle support mobile browsers behave more appropriately, and on Android and iOS, this functionality works without problems.

Specialists in PayPal decided to tackle the availability of video and solve it entirely within HTML5 without any additional dependencies or third-party plug-ins. The project has the following purposes:
− Create embedded video player with support of controls and subtitles using only latest HTML5 technology;
− Minimize the weight of the code (5 kB CSS and 18 kB JS);
− Ensure full keyboard control and accessibility for non-visual screen access programs;
− Provide subtitles support (using WebVTT).

First of all a usual video container is used, allowing you to keep the core functionality in a situation of a mobile browser or disabled JavaScript, because then instead of custom implementation a standard HTML5 player appear. If a user comes from the modern PC browser with enabled JavaScript, it offers him a player customizable interface with modified controls, design and support for subtitles (if any), and most importantly all this is characterized by maximum accessibility for users with different disabilities.

Management restart, start / pause, and rewind controls implemented through buttons, turn on / off the sound and subtitle of the elements – by checkboxes and the volume setting is implemented through input with a predetermined range.

License of created HTML5 video player allows fully free usage of it.

The weak point of this project is absence of provided hotkeys or at least access key attributes for controls that would substantially increase the availability of the player for the users of non-visual screen access programs. Because of their interaction, in most cases through the audio channel, the sound being played in video may prevent them find a control, whereas the presence of hot keys would help control the player without having to focus on buttons and check boxes.

From a user perspective HTML5 advantages will be felt immediately: cross-browser and cross-platform features to make representations on the website universal on majority of devices used by the consumer. HTML5 will end the need for endless plugin updates, because no other additional add-ins will be required.

Of course, in the near future HTML5 will not become a full replacement for Flash. But in the long term, I think that HTML5 will replace Flash gradually from the Internet and Flash will completely move into other industries, for example, as a tool to create interactive presentations.

How quickly this happens depends on how quickly W3C will adopt the new standards of web development and Web developers will accept the new technology. But the fact that it will happen in the foreseeable future is indisputable.

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FLEXIBLE HIGH-RESOLUTION DISPLAYS
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The recent discovery will allow to create pixels in only some hundreds of nanometers.This will open the way for high definition displays and exceptional subtlety and flexibility. They, of course, find their application in developing areas: a smart glasses, synthetic retina and folding screens.

The team of scientists from Oxford University found that the addition of the seven–nanometer layers of material called GST sandwiched between two layers of the transparent electrodes allows you to draw an image using a small current in the "stuffing" of this sandwich. Tiny layer can be converted into pixel prototypes devices.

These "nanopixels" – only 300 by 300 nanometers – can be electrically switched on and off, creating colored dots which become the building blocks for displays with extremely high resolution.

Layers sandwich GTS is created using the technique of spraying when the target is bombarded with high-energy particles and atoms of a target accumulating on other material a thin film.

As layers that constitute the device a thin film may be applied. They can be incorporated into very thin and flexible material. The method works on flexible mylar sheets thickness of 200 nanometers. This makes them potentially useful for use in "smart" glasses,

folding screens, windshields and even synthetic retina that mimics the ability of photoreceptor cells in the human eye.

One advantage of the design is that unlike most conventional LCD screens there is no need to constantly update all pixels – the only ones that need to be changed. Static pixels remain in their places. This means that any display based on this technology would consume very little power.

Studies have shown that flexible and thin displays based on this technology will be able to switch between power-saving mode "color e–reader" and the video playback mode with backlight.

These displays do not require expensive materials and, as will be solid, promise to be reliable and easy to manufacture. Tiny nanopixels make them ideal for use in all sorts of smart glasses, when the quality and resolution of the image is extremely important. This image can even be as close as possible.

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BOOTSTRAP
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If you are interested in web-design, you have exactly seen the word "Bootstrap". It is commonly found in articles about web-design and web- engineering. You may have also heard this word surrounded by web-designers at coffee shops, bars, pubs or restaurants around all over the world. They know what Bootstrap is and the great benefits that it can give the web-engineering world.

Bootstrap is powerful, intuitive mobile front-end framework for faster web development. It uses HTML, CSS and Javascript.

Many people would compare web engineering with art, and each engineer has his own way of doing things. That works sometimes, but when there are several people working on the same project with different styles of coding, mistakes are inevitable. Mistakes and inaccuracies cause major problems in such projects. A large accumulation of uncertainties leads to incorrect work .Bootstrap was developed by Twitter engineers Jacob Thorton and Mark Otto as an attempt to encourage Twitter's engineering team. Their main idea was to minimize inconsistencies that might arise during the development. This project was very effective: the whole team worked faster, more effectively and without inconsistencies.

Bootstrap is not the only framework in its field, but it has many advantages over other Css frameworks. Here are some of them:
− Cross-browser compatibility: It is supported by all popular browsers.
− Easy start: All that is necessary to start is knowledge of HTML and CSS. Also the Bootstrap official site has a good documentation.
− Grid system: Very effective system of grids makes your job easier.
− Responsive design: Bootstrap's responsive CSS adjusts to Desktops and Mobiles.
− Built-in components: Bootstrap contains beautiful and functional built-in components which are easy to customize.

− Provides a simple and effective solution for creating an interface for developers.

Bootstrap isn't unchanging. A great aspect of it is that you can make it your own. Anytime you can sit down and read the whole framework. After that, you can delete what you don't need. The whole point of Bootstrap is that it is able to adapt to your project. This is the main reason why people appreciate bootstrap.

Every web developer knows the importance of grids. Unfortunately we can't see many examples on internet. Nowadays, "rubber sites" are gaining popularity. But "rubber site" is very difficult task for the developer. Bootstrap provides an opportunity to do this easily, efficiently and beautifully.

If you're administering a site which is already live, but you need to improve some design in it, then Bootstrap can help. You can always take the necessary styles or classes and copy them to the CSS file you are working with. Bootstrap replaces the current style with your own. As you can see, bootstrap is an ambulance and accessible platform, that makes it easy for a developer to create a nice design for a website or web application. So, use it and enjoy your work.

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REST API

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Representational state transfer (REST) is an abstraction of the architecture of the World Wide Web; more precisely, REST is an architectural style consisting of a coordinated set of architectural constraints applied to components, connectors, and data elements, within a distributed hypermedia system. REST ignores the details of component implementation and protocol syntax in order to focus on the roles of components, the constraints upon their interaction with other components, and their interpretation of significant data elements. The term *representational state transfer* was introduced and defined in 2000 by Roy Fielding in his doctoral dissertation at UC Irvine. REST has been applied to describe desired web architecture, to identify existing problems, to compare alternative solutions and to ensure that protocol extensions would not violate the core constraints that make the web successful. Fielding developed REST in collaboration with his colleagues during the same period he worked on HTTP 1.1 and Uniform Resource Identifiers (URI). The REST architectural style is also applied to the development of web services. One can characterize web services as "RESTful" if they conform to the constraints described in the architectural constraints section.

The REST style emphasizes that interactions between clients and services are enhanced by having a limited number of operations (verbs). Flexibility is provided by assigning resources (nouns) their own unique universal resource indicators (URIs). Because each verb has a specific meaning (GET, POST, PUT and DELETE), REST avoids ambiguity. As described in a dissertation by Roy Fielding, REST is an "architectural style" that basically exploits the existing technology and protocols of the Web, including HTTP (Hypertext Transfer Protocol) and XML. REST is simpler to use than the well-known

SOAP (Simple Object Access Protocol) approach, which requires writing or using a provided server program (to serve data) and a client program (to request data).

With all the hype surrounding RESTful web services, you'd think it was suddenly a new concept that burst forth on the scene only a year or two ago. Truth is, the concepts underlying RESTful APIs are as old as the web itself (which is to say, about 20 years old) and are really best understood from that perspective. Before diving into what RESTful APIs are, let's address why you should care. Hundreds of methods have sprung up over the years to get computers connected together via a network. The evolution of these methods, or "protocols", has led to the acceptance of a stack of agreed upon standards, each addressing computer communication in a specific way. At the top of this stack there are the Application and Presentation layers, where business logic and the data resulting from it is exchanged. REST sits on this stack in a way that makes it easy for humans to understand what's being exchanged while allowing computers to talk to one another efficiently. You may have also heard of some of the other technologies that can reside here, such as SOAP (which requires a fair amount of data and computing power and is not really appropriate for the constrained resources of mobile applications),

JMS (which is specific to Java applications) and XML-RPC (which has many of the same problems as SOAP without any of the benefits of standardization). REST allows for a minimum amount of data to be passed using the same well-established mechanisms that define the web without a lot of the encumbrances introduced by fatter protocols. This allows programmers to build more rapidly programs that access and act upon data exposed via APIs, even in environments with unreliable network speeds and limited computing power. REST works almost exactly like a website in a browser.

A resource is exposed to a program via a URL. The program can access that URL and receive data about the resource, not unlike when you type in a URL to your browser and get a web page back. Well designed RESTful APIs include additional links and the program can follow to request related information – similar to how you would click on a link to visit a new page – or to submit data to update the given resource – similar to how you would fill out a web form to create a new account for a web site. The tradeoff for all of this flexibility is a lack of strongly set standards. REST really describes the method by which the data is transferred.

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DIE BEARBEITUNG DER WAVELET-KOEFFIZIENTEN FÜR DIE RAUSCHUNTERDRÜCKUNG

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In letzter Zeit werden die auf der Wavelet-Transformation gegründete Methoden der Datenverarbeitung, breit verwendet. Wavelets sind mathematische Funktionen, die die Analyse verschiedenen Frequenzkomponenten der Daten ermöglichen. Wavelets haben erhebliche Vorteile gegenüber der Fourier-Transformationen, weil die Wavelet-Transformationen die Möglichkeit geben nicht nur über das Frequenzspektrum des Signals, sondern auch über den Zeitpunkt, in den diese oder jene harmonische Komponente erscheint zu beurteilen. Mit ihrer Hilfe kann man die abgebrochenen Signale oder die Signale mit den

scharfen Zacken leicht analysieren. Außerdem dank Wavelets, kann man die Daten laut dem Maßstab, auf einem der aufgegebenen Niveaus (klein oder groß) analysieren.

Im Elementarmodell wird vermutet, dass verrauschtes Signal lautet $s(n) = f(n) + \sigma \cdot e(n)$, wo $f(n)$ das Nutzsignal ist, σ der Geräuschpegel ist, $e(n)$ additives weißes gaußsches Rauschen ist, d.h. die stationäre zufällige Reihenfolge mit der mathematischen Null Erwartung, absolut unkorreliert und mit der Dispersion, die der Einheit gleich ist. Ziele sind die Unterdrückung des Rauschanteils $e(n)$ des Signals und die Wiederherstellung von f.

Bei der Wavelet-Analyse wird das Signal auf die approximierenden Koeffizienten, die das geglättete Signal vorstellen, und die detaillierenden Koeffizienten, die die Schwingungen beschreiben, zerlegt. Folglich wird der Rauschanteil in den detaillierenden Koeffizienten besser widerspiegelt. Deshalb werden bei der Rauschunterdrückung gewöhnlich die detaillierenden Koeffizienten bearbeitet. Die zweite Annahme besteht darin, dass der Rauschanteil im Absolutwert kleiner als das Nutzsignal ist. Deshalb besteht die Elementarweise der Rauschunterdrückung darin, dass die Koeffizienten, die unter dem Grenzwert sind den Nullwert gleichzumachen. Dieses Lösungsverfahren heißt Schwellwertbildung (thresholding) der Koeffizienten. Weite Verbreitung haben solche Schwellenwertverfahren, wie die harte Schwellwertbildung und die weiche Schwellwertbildung bekommen.

Bei der harten Schwellwertbildung bleiben alle Koeffizienten, die nach dem Absolutwert größer oder gleich dem Schwellenwert τ sind, unveränderlich, und die kleineren Koeffizienten werden dem Nullwert gleichgemacht. Bei der weichen Schwellwertbildung neben der Nullsetzung der Koeffizienten, die dem Modul nach kleiner als der Schwellenwert τ sind, geschieht die Herabsetzung übrigen Koeffizienten dem Modul nach auf die Größe τ.

Bei der Lösung der Aufgabe der Rauschunterdrückung muss man den Spektralbestand des Rauschanteils bewerten, den Typ der Schwellwertbildung und das Kriterium der Berechnung des Schwellenwerts wählen.

Von der Wahl des Schwellenwerts des Rauschhintergrunds (der Dispersionsschätzung des Rauschens) hängt die Qualität der Rauschunterdrückung des Signals ab, die in Form von Signal-Rausch-Verhältnis bewertet wird. Die Festlegung des kleinen Schwellenwertes bewahrt den Hintergrund in den Koeffizienten der Detaillierung und bringt deswegen nur zur unbedeutenden Vergrößerung des Signal-Rausch-Verhältnis.

Bei den großen Schwellenwerten kann man die Koeffizienten, die wesentlichen Informationen tragen, verlieren.

Die Suche der optimalen Bedeutung τ_0 bedeutet das Finden solchen Schwellenwert, der bei der kleinsten Absetzung des wiederhergestellten Signals die größte Bedeutung des Signal-Rausch-Verhältnis gewährleistet.

Stein's Kriterium der unabsetzbaren Risikoschätzung ermöglicht die Bestimmung des optimalen Schwellenwertes, die dem Zerlegungsniveau des Signals, wie ein Argument einiger Risikofunktion, bei dem die vorliegende Funktion die minimale Bedeutung übernimmt.

Die Qualität der Rauschunterdrückung des Signals (das Signal-Rausch-Verhältnis) hängt auch von der Anwendungsweise der Schwellwertbildung ab.

Es werden die folgenden Weisen der Schwellwertbildung eingesetzt:
− allgemeine Schwellwertbildung, die sich unter Ausnutzung des fixierten Schwellenwerts verwirklicht;

− Mehrebenenschwellwertbildung, der sich unter Ausnutzung des Schwellenwerts verwirklicht, dessen Bedeutungen sich vom Niveau zum Niveau ändern;

− lokale Schwellwertbildung, in dem die Schwelle, variabel nach dem Zerlegungsniveau und von der Position der Koeffizienten der Detaillierung abhängend auf dem gegebenen Niveau verwendet wird.

So besteht das Verfahren der Rauschunterdrückung des Signals aus drei Schritten.

1. Die Dekomposition. Es werden das Wavelet und das Zerlegungsniveau N ausgewählt. Es wird die Wavelet-Zerlegung des Ausgangssignals bis zum Niveau N ausgerechnet.

2. Die Schwellwertbildung der detaillierenden Koeffizienten. Für jedes Niveau von 1 bis zu N wird die Schwelle ausgewählt und wird weiche oder harte Schwellwertbildung der detaillierenden Koeffizienten verwendet.

3. Die Rekonstruktion. Es wird die Wavelet-Rekonstruktion ausgeführt, die auf den approximierenden Anfangskoeffizienten des Niveaus N und den modifizierten detaillierenden Koeffizienten des Niveaus von 1 bis zu N gegründet wird.

Die Rauschunterdrückungsverfahren mit Hilfe der Wavelet-Transformation wird breite Anwendung in den grundlegenden Forschungen, der technischen und medizinischen Diagnostik, den Systemen der Sendung der Informationen, seismischen und Radarsystemen, bei der Entwicklung der Systeme des künstlichen Intellekts finden.

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UNMANNED AERIAL VEHICLES IN PROVIDING MODERN WARFARE

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Creation of a new combat complex is considered appropriate in the event that in weapon system under design conditions of use it will ensure achievement of required level of performance at the lowest cost in solving forecasting scope of combat assignments. Therefore, battle drones are actively developing in the leading military powers of the world.

The main deficiencies of prospective weapons systems development are associated with the implementation of new military-strategic concepts and technologies of warfare, including network-centric and contactless wars technologies, surveillance and strike operations, high-precision and selective defeat, etc.

First of all, intelligence UAV should be highlighted. Development of the UAV is related to the shortfall of information support of military operations, in particular because of the increase of highly dynamic conflicts importance (including local ones) as operational efficiency of information (intelligence) software and implementation of reconnaissance operations in real time become important. Foreign experience of UAVs application in local conflicts confirms the perspectives of this type of UAV.

The second promising area of military purposes UAVs on the background of the technological advances of the last ten years are combat (offensive) UAVs. Existing concepts of combat UAV consider them in the common system of Air Force striking powers in the performance of main tasks of objects destruction and supportive tasks for the benefit of combat employment of manned strike weapons. Therefore, in determining their role and place in the Air Force modeling at mixed air forces is required. In mixed groups combat UAVs focus on combat missions, the implementation of which is associated with high risk

of loss, or tasks that can not be implemented by manned AC due to restrictions on the physiological capabilities of the crew. As part of a group of key indicators that determine the combat capabilities of the combat UAVs indicators related to the efficiency of combat flight are considered (survival in air defense system, the survival rate at the base airport transport capabilities, ammunition and weapons effectiveness, navigation accuracy and information capabilities), implemented with reusable, intensity, and with a number of departures. Another group of indicators is related to the cost characteristics, including life-cycle cost and its main components. The cost factor in the present conditions becomes significant limiting factor in the development and improvement of weapons systems. In this respect, UAVs have the potential prerequisites to reduce the cost of life-cycle compared with manned AC by reducing operating costs, including peculiarities of the operation of UAVs, including the implementation of the main part of UAVs grouping operation in storage mode, and the lack of flight training requirement and maintaining flight personnel combat training using real flights.

In conclusion, it should be noted that the creation of combat unmanned aircraft systems is a complex problem. Unmanned system is not only the aircraft, but also vehicle information sensors, on-board intelligent control system, communication lines, and other means of destruction. For the success of the program in the field of combat UAVs it is necessary to create the advanced scientific-technical and technological developments on aircraft, promising engines, avionics. In conditions of limited financing new approaches to implementation of military missions have to be found, including, for example, approaches associated with unification, using of commercial technology, cooperation with other countries.

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ARTIFICIAL INTELLIGENCE IN VIDEO GAMES
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Every one of us has heard about artificial intelligence. This is the intelligence performed by software or technics. Artificial intelligence is usually related to study and design of intelligent agents, i.e. systems that perceive their environment and make decisions that help them maximize chances of success in achieving some specific goals.

In video games, AI is a set of software techniques used to create the illusion of intelligence in the behaviors of the characters controlled by computers (non-player characters). These behaviors often simulate human-like intelligence. From the very beginning of the gaming industry, starting with games like Pong, artificial intelligence tools have become an integral part of almost any computer game.

Artificial intelligence in video games differs a lot from traditional artificial intelligence because it is centered on gameplay and appearance of intelligence and is limited with restrictions of the software environment. For example, quite often people wish computer abilities to be toned down so that they could even the odds. In fact, nowadays artificial intelligence in video games doesn't have to be sentient and even doesn't have to learn during the character's activity. What it really has to do is to simulate intelligent

behavior so that players believe it and get some challenges that they can overcome by means of their perseverance and their own human intelligence.

Various uses of artificial intelligence in video games may be divided into such main groups:

− moving bots (rectilinear motion, motion with acceleration and turns, motion in a group, motion that takes into account the laws of physics, jumping, coordinated motion in a group, control of engines in driving simulations);

− path finding (Dijkstra's algorithm, A* search algorithm, hierarchical path finding);

− decisions (decision trees, state machines, fuzzy logic, purposeful behavior, rule-based systems, scripting);

− learning (modification of parameters, prediction of actions, improved decision making, reinforcement learning, artificial neural networks).

Basic system needs for game artificial intelligence vary depending on the role that it is used for, but generally there are few necessities. Compound systems usually have more requirements to introduce artificial intelligence. In small systems primary needs are just the processing time needed to let the artificial intelligence function. More complex systems require some extra means for perceiving the environment, evaluating the success of previous decisions made by characters.

One of the most common game types which use artificial intelligence is an intelligent game with two or more characters some of which may be non-player ones, like chess. The ability to effectively foresee an enemy's next move and decide what action to take is critic in adaptive systems. This can be achieved by using different methods, such as past-pattern recognition or random guess. One widespread method for adaptation is to memorize past choices and assess their success. The system in this method keeps a record of decisions a player has made in the past. Then they must be somehow evaluated. Sometimes it's useful to gather additional information about the situation in order to give the decisions some context. This extra information may include previous actions, the character's health, position in the level and may be evaluated to determine whether previous actions were successful or not and whether the entity needs to change its tactics. At the beginning of the game the activity of the character may be guided by general tactics or random actions. By this time list of past actions hasn't been built, so we can't use the history of characters' activity for making new decisions.

It's hard to explore the area of artificial intelligence in general and in video games in particular. Despite of the complexity of this field of technologies, most of artificial intelligence specialists look to the future of their sphere of work with optimism. Artificial intelligence in games may be quite different depending on the needs of each game in its uniqueness. For example, it can appear as a simple set of rules or as a sophisticated adaptive system. I think that introduction of artificial intelligence to games and its further development is necessary to raise the believability of the characters of modern video games. It's a complicated area of research, but what an interesting and inspiring one.

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APACHE MESOS – MODERN RESOURCE MANAGER FOR BIG CLUSTERS

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In the modern world of IT more and more clients(in the most enterprises) need new level of computing, in terms of performance, price, scalability and availability. Clusters are the suitable solution for most customers with such requirements. Cluster is a set of computers which are tightly or loosely coupled and in most cases are treated as one solid system. Cluster's nodes are run and scheduled by specific software. Mesos is proposed as a powerful tool for managing varied frameworks designed for clusters, using a common interface between frameworks for managing resources of cluster.

Prevalence of clusters

Systems of computers connected and used together as one large computer are becoming very popular these days. The reason is such systems are able to provide needed computing power to web services and large number of research applications. Because of such great variety of technologies appearing, a universal framework for managing them is needed. There are various platforms which provide cluster management tools in case of varied frameworks are used. For example, well-known Hadoop is among them. One of the recently introduces platforms is Mesos by Apache, introducing resource offering – scheduling mechanism which consists of two layers. Design purposes Mesos' purpose is to provide reliable facility to let varied frameworks use clusters in an efficient way. Also, it should be scalable and simple. Frameworks for clusters are becoming widespread, so it is essential to create a standard for them. As they are very varied the reasonable design approach was defining a lightweight interface that allows frameworks to manage resources effectively, and let the frameworks provide schedule and launch their tasks the way they were designed to.

Isolation and resiliency

Mesos uses operation system's concurrency mechanisms when working with nodes in slave mode. Those tools are specific for each operation system, but cross-platform modules are supported also. Platform dependency requires Mesos to require specification that used frameworks need conform to. Reliability is also important in clusters because all the used frameworks rely on Mesos master.

That's why master is always has a special backup, so settings contained in the slave machines and framework's schedulers are used as a storage, that can be used to configure the new master if the old one fails. Actually, the only information master holds is list of its slaves, running frameworks, scheduled tasks. This data is needed to get the amount of resources each framework is using and determine the allocation policy. In case of failure one of the nodes chosen by a pre-configured algorithm becomes master by gaining all thee needed information from other slaves. This is a commonly used approach in providing reliability in distributed systems.

Mesos is a powerful cluster facility that provides efficient resource management, scalability and fault tolerance. Mesos main components are sharing model and scheduler. The sharing model is fine grained and applies to task level, as well as scheduler is

distributed and uses frameworks to determine the task schedule at runtime. Using the named elements Mesos is created for maintaining highly loaded systems, be highly responsive to architectural changes and be able to work with a great variety of different frameworks. At the same time, it stays scalable and consistent. Existing frameworks can effectively share resources using Mesos.

Mesos enables the development of specialized frameworks providing major performance gains, such as Spark, and Mesos's simple design lets the system be fault tolerant and to scale to fifty thousand nodes. Clusters which have more nodes can be divided to several part and each part can be treated as a separate cluster, which also managed by Mesos, so the actual number of physical nodes is almost infinite and limited only by performance issues. So, if a software developer correctly automates distributing data for computing and collecting the results, he can effectively use any number of machines the cluster has.

Apache now tends to develop a great variety of frameworks and facilities for managing distributed systems, so creating a universal framework that will allow all of them work together is quite natural. On the whole, managing sophisticated systems is becoming really simple these days, because much work has been done by different communities and companies. If more and more software manufacturers follow the trend, the new level of computing will be reached soon. Clusters will become completely platform-independent and frameworks – 100% compatible with each other. Apache Mesos is one more unique facility that will help to develop and popularize using distributed systems as primary computing platform. Hopefully, developers and system administrators will give this tool a chance.

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RECENT ADVANCES IN HARDWARE-BASED ARTIFICIAL NEURAL NETWORKS

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For simple calculating purposes, a conventional computer can easily outperform the human brain. But there are a huge amount of tasks that the human brain – or computer systems that were designed to operate with the similar principles – can do far more efficiently than a traditional computer. And there're some behaviors of neurons that have never been approached by computerized systems yet.

Partially it's because of the radical differences between neuron`s and traditional transistor`s structure and behavior. The behavior of neurons can be imitated by software, but the hidden discrepancy makes such software relatively ineffective.

A team of researchers at Cornell University and IBM Research allied to design a chip that is radically different: an asynchronous collection of thousands of tiny processing cores, each capable of the unpredictable spikes of activity and sophisticated connections that are typical of neural nature. When hosting a neural network, the chip has proven remarkable power efficiency. Also the scientists say that their architecture can be arbitrarily scaled, allowing the creation of a neural network supercomputer.

Semiconductor transistor works in binary: it is either in "1" or "0" state, and its state is able to directly impact only the next transistor it is wired to. Neuron works in a different way. Neurons are able to receive inputs from an voluntary amount of other neurons by connections called dendrites, and they can send signals to a large number of other neurons using structures called axons. And the signals they send are not binary, they are analog. Neuron's signals are series of "spikes" of activity, with the data encoded in the timing and frequency of these spikes.

While this type of behavior can be modeled on a customary computer, the researchers who take part in the work state that there is a fundamental mismatch that limits efficiency. While the connections between real neurons are physically part of the brain`s computation structure, their artificial counterparts are stored in the RAM of a computer, modeling the brain, which means the processor has to wait the time, needed for retrieval of information from memory, any time it wants to see how a single modeled neuron should behave.

The new processor, which was called TrueNorth, takes a thoroughly different approach. Its 5.4 billion transistors incorporate over 4 thousands individual cores, with each containing a complex of circuitry that behaves in same way as a set of neurons. Each core has about 100 kB of memory, where the neuron's state, the addresses of the neurons it receives signals from, and the addresses of the neurons it sends signals to are stored. The value that reflects the strength of different connections is also stored in a memory, it is similar to real neurons. Each core is capable of receiving input from 256 other "neurons" and sending spikes to a further 256.

There is also contains the communications hardware in every core, which is needed for delivering signals on to their destination. The addressing on the chip uses two coordinates: one − to get to the right core and another is a neuron number. There are random numbers generators cores in order to fully model the slightly stochastic spiking activity similar to real neurons.

Generally, TrueNorth has a million programmable neurons that can establish 256 million connections between them. The chip is controlled by a clock that operates at a leisurely 1 kHz. But the communications between neurons are asynchronous, and any core that has no current task becomes idle. As a result, the power density of TrueNorth is only 20 milliwatts per square centimeter (it is 2500 times less that in typical modern processors).

The authors assert that TrueNorth could become a valuable co-processor for systems that are designed to run existing neural network software. The current architecture of such chips is bi-dimensional, but, according to authors, it can be expanded into third dimension with relatively small efforts. "We have begun building neurosynaptic super-computers, "the authors state", "by tiling multiple TrueNorth chips, creating systems with hundreds of thousands of cores, hundreds of millions of neurons, and hundreds of billions of synapses." If they reach their goals, a totally new branch of neurosynaptic super-computers might appear which performance will be counted in SOPS, or synaptic operations per second, instead of the common used FLOPS.

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CONTROL OF RADIATING TECHNICAL EQUIPMENT OF TELECOMMUNICATION SYSTEM

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The actualization of the obtained data is the main problem of controlling electromagnetic radiation by using method of direct measurements afield. Updating information is extremely slow − this is due primarily to the large areas of control [1].

The problem of data updating can partially be solved by installing stationary monitoring. However, this solution requires a significant investment and as a result updated information concerns small controlled areas.

In order to increase the controlled area without installing additional stationary monitoring device, the periodic 'field trip' is practically used with the mobile monitoring devices. The mobile monitoring device is often composed of broadband receiver with the option of recording data on an external storage medium. Also, alongside with data about the sources of electromagnetic radiation saving the current coordinates of the mobile device are saved . After the organization of such "field trip", the data are processed in an automatic or semi-automatic mode, there is a comparison of the obtained data with the database of registered devices, etc.

The main drawback of monitoring electromagnetic radiation is a low degree of relevance of the obtained data, besides the sources of radiation which were in a disabled state at the time of traveled near this monitoring devices ,are not registered.

Alternative solution to the problem of data updating can be to create a mobile sensor network monitoring of electromagnetic environment, constantly 'patrolling' the streets of the city.

Block diagram of a sensor network can consist of two main elements: a central control unit and a mobile data acquisition module.

Central control unit must represent hardware and software system that performs the following main functions: data collection with mobile units, classification and storage of the obtained data, the management functions of the mobile units, the output (rendering) of the data for the system operator.

Software core of the central control unit can become a special geo-information system (GIS). The main stage of module operation will be a obtaining of data − in this case it is necessary to form a vector or raster files with the coordinates of the mobile data module and additional attributes in the form of scanned information.

In the phase/stage of obtaining data for further optimization process, it is necessary to conduct primary classification of data and use different repositories for different frequency ranges.

The foundation of the mobile module sensor network of electromagnetic radiation control is the wireless data network consisting of mobile units control. Each unit is equipped with a master controller, measuring devices, data storage devices, positioning system and a wireless interface.

The leading universities of the world are developing such mobile devices. In particular, the University of Trento has proposed the device for estimating EMR in real time. It is based on the principle of "turn on-measure − transmit data-turn off" that allows obtaining real time data. The system is composed of a set of *N* sensor nodes, each one equipped with a broadband field probe, and a gateway node connected to a PC via serial interface [3].

In The Institute of Telecommunication Systems it is planned to improve this device with the use of radio modules XBee and programmable Arduino boards to build ZigBee sensor networks.

Using a mobile platform for public transport will allow us to create a sensor network of electromagnetic radiation control with a high degree of relevance of data and wide-area coverage, and the use of geographic information systems for obtaining, processing and visualization of data will build a high-performance tool for monitoring the electromagnetic radiation on the territory of megalopolis.

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APPROACHES TO ARBITRAGE OPERATIONS PROBLEM
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Arbitrage operations allow gaining profit without risks and don't demand any additional investment. Arbitrage operations facilitate restoration of parity ratio between codependent assets [1]. The most common objective of arbitrage operation solution is planning arbitrage operations in way that enables profiting in result of list of deals on account of differences between exchange rates of currencies, if possible. Common approach to solution of this problem is reducing it to negative weight cycle search problem [2]. Similar approach is used in this research, though unlike [2] it considers different algorithms.

We consider table of exchange rates for list of n currencies. Information about exchange rates is given as matrix R with dimensions $n \times n$, $R[i, j]$ corresponds to rate of exchange of currency i into currency j (in other words, for 1 unit of currency i one can get $R[i, j]$ units of currency j). Profiting cycle is an ordered list of currency exchange operations that enables gaining profit on account of differences between exchange rates of currencies. The following relation is valid for such sequence [3]:

$$R[i_1,i_2]\cdot R[i_2,i_3]\cdot...\cdot R[i_{k-1},i_k]\cdot R[i_k,i_1]>1.$$

1)

To allow usage of shortest path search algorithms we have to switch multiplicative objective function to additive. Define matrix *W* with dimensions $n \times n$:

$$W[i, j] = -\ln R[i, j].$$

2)

Switching to logarithms means the reduction of multiplicative objective function to additive. We get new objective function: sum of elements *W[i, j]* that are included in exchange plan. Profiting cycle $i_1,i_2,...,i_k$ can be represented as:

$$W[i_1,i_2]+W[i_2,i_3]+...+W[i_{k-1},i_k]+W[i_k,i_1]<0,$$

3)

Thus problem reduces to negative weight cycle search problem *W*.

Apporaches that use the applications of Bellman-Ford and Floyd-Warshall algorithms for negative weight cycle search problem are considered in this research.

Bellman-Ford algorithm is used tp find shortest paths from one vertex to all others vertices. Bellman-Ford [3] does $n-1$ iterations, and returns *TRUE* value if graph doesn't contain any negative weight cycle reachable from initial vertex or *FALSE* value otherwise, in this case existing negative weight cycle may be recovered using vector of predecessors π in several ways, one of them is if $\pi[s] = NIL$ execute extra iterations until one of the vertices becomes predecessor for vertex s ;

After this negative weight cycle is recovered according to the next algorithm:

STEP 1. Set index of current vertex a $v := s$, initialize list of visited vertices C ;

STEP 2. IF list of visited vertices C already contains current vertex – cycle found, GOTO STEP 3, ELSE add current vertex to the list of visited vertices C and set v index of predecessor of current vertex $v := \pi[v]$, then REPEAT STEP 2;

STEP 3. Delete indexes positioned before first occurrence of v from list C , add v to list C . RETURN c list C that contains negative weight cycle END.

Floyd-Warshall [3] may be applied for searching negative weight cycles (algorithm finds at least one of them [4]). They can be recovered by the matrix of precedence Π (by elements $\Pi[i][i]$) using the next algorithm:

STEP 1. Initialize empty list of found negative cycles, select vertex i as initial;

STEP 2. IF number of current vertex $i > n$ RETURN C list of found negative weight cycles, END, ELSE initialize empty list of visited vertices C , set index of current vertex $v := i$;

STEP 3. IF list of visited vertices C already contains current vertex – cycle found GOTO 5, ELSE add v to list of visited vertices C and GOTO STEP 4;

STEP 4. IF current vertex hasn't got predecessor increment index of current vertex by 1 and GOTO STEP 2, ELSE set $v := \Pi[v][v]$ AND GOTO STEP 3;

Program implementations were developed using MS VS2013 IDE in C++ (hereinafter: method 1 – method for Bellman-Ford algorithm, method 2 – method for Floyd-Warshall algorithm). Series of experiments were performed with this software using PC with 3.3 GHz processor and 2GB RAM.

Table 1 – Relation between OT of methods 1 & 2 and number of currencies

Number of currencies n		< 100	100	200	300	500	1000	2000
Method 1	Time, sec	0	0	0.034	0.13	0.443	3.697	29.134
Method 2		0 □ 0.032	0.032	0.076	0.229	0.78	4.624	35.501

Based on series of experiments one can make following conclusions: due to its performance method based on Bellman-Ford algorithm, is advisable to use for tasks that require verification if profiting cycles exist and find only such cycle if they do exist, while approached based on Floyd-Warshall algorithm is advisable for tasks that require finding several profiting cycles.

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THE SEMANTIC WEB

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"How to teach computers to understand information like a human?" It is a question scientists all around the world are asking themselves. "How to make information contained in WWW readable not only for people, but for computers as well?" "How to make computers see and make decisions like a human being?" The answer was given in the early 1960's by Allan Collins.

Recently the Semantic Network Model was presented. Now it is only a concept, but scientists continue to work on it. Tim Berners-Lee, best known as a father of a WWW, formed the term "semantic web". The term means "web of data that can be processed directly and indirectly by machines."

The main objective of this technology – to enable users to search information more quickly and effectively.

In a typical Web, based on HTML pages, the information is embedded into text and retrieved by person using the browser. The Semantic Web also requires a record of information in the form of a semantic network using ontologies. A client program can directly extract information from the web and make logical conclusions. Semantic Web works in parallel with the usual web and on its basis, using the HTTP protocol and resource identifiers URL. It allows machines to exchange and interpret information, implement access to information more intelligently. Thus, search engines become more effective, and users will be able to find information exactly they need. Organizations that provide a variety of services will be able to index them with a special meaning, users will be able to find these services quickly by using software based on the Internet, and use them in combination with other services.

The standards for Semantic Web are promoted and overseen by World Wide Web (W3C). These standards include: a flexible data model, an ontology language, a query language, a language of rules and a language for marking up data. Using Semantic Web Technology we can realize a considerable number of applications and algorithms. A main goal is to help to make sense of large or complex sets of data without being supplied with any predetermined knowledge about the data.

The technology requires a single global network which should provide access to some collections of data. Also it's necessary to have a set of rules which is used to lead automated reasoning. The main goal of this technology is to turn meaningful data of web pages into some structure. In this environment special software agents will be able to search information more rapidly and carry out complicated user's tasks.

The first step in deployment the Semantic Web into the structure of the existing Web has already begun.

Soon computer will be improved. It will handle data faster and perform conceived task. New developments will bring completely new functional possibilities. Semantic processing structures data. It can assist the evolution of human knowledge.

These technologies are still not put into practice. Maybe because sometimes it all sounds a kind of abstract, and the necessary tools are still in development. However, some sites are already using Semantic Web concept, for example, Wolfram Alpha.

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WEB-ORIENTATED ENVIRONMENT FOR DISTANCE LEARNING
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Always one of the major problems of mankind was learning, transfer of acquired knowledge from generation to generation. Knowledge was passed from person to person through communication or through literature.

Distance learning has gained popularity in recent years. Instructors from all over the world are using the potential of distance education to teach people from all around the globe and give them opportunities to work cooperatively on educational projects.

This project deals with the development of the Web-orientated environment for distance learning.

The Web-orientated environment is a site that includes static and dynamic pages which allows users to create and manage learning courses, to pass the online assessments, e.g. quizzes and exams, and to communicate with teachers and other students.
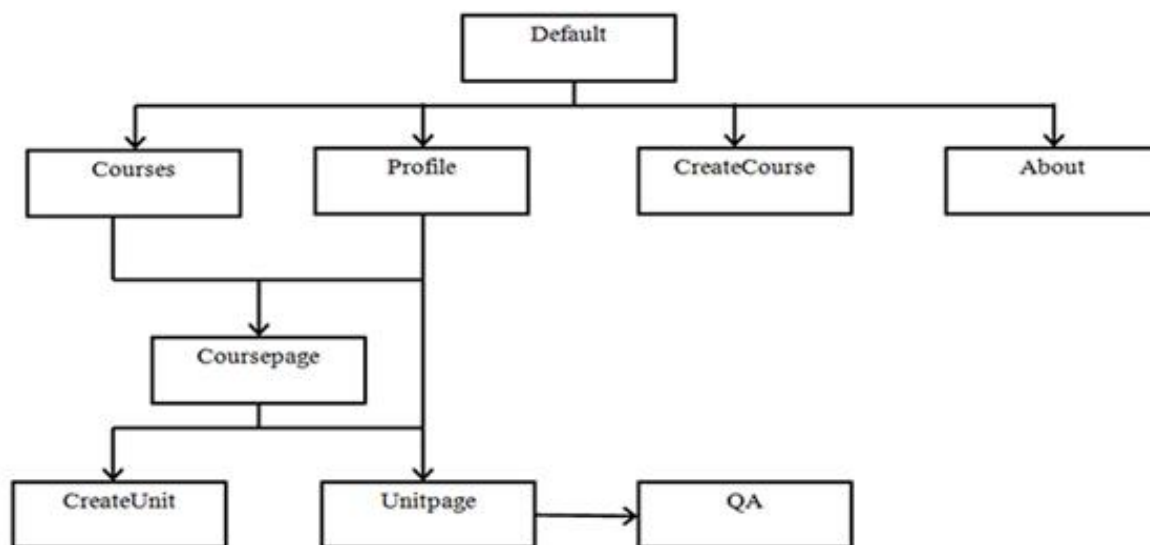
Hierarchical resource structure

Data security of the web-resource is realized by using access rights separation. Guest access allows only reading of allowed information, e.g. course descriptions, lectures under construction etc. Only course owners and administrators can edit courses and lectures.

In this project the following technologies were used: ASP.NET Webforms to create webpages, Language Integrated Query (LINQ) to work with database, Asynchronous Javascript and XML (AJAX) to implement dynamic partial-page updates. Web-resource works stable in the most popular browsers: Mozilla Firefox, Google Chrome, Internet Explorer.

In conclusion, in this project was developed web-resource, which can be used for distance education.

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JAVA IN INTELLIJ IDEA
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Intellij idea is Java IDE by JetBrains with a lot of helpful features. Java is a wordy language. And sometimes, it is not very interesting to write a lot of symbols, words etc.

Writing a lot of symbols takes much time. So programming scientists started to think about how to do it faster, and started to create IDEs.

Despite the fact that Intellij idea is IDE which was made for Java developers, other developers, who use other languages, can make some settings in this IDE to use one for their non-Java code.

Software created by using IDE can be written on many different operating systems: Windows, Linux, Mac etc. The Intellij idea has opportunities to work with Application Server, Web Application, Batch Applications, Android Application and etc.

To start these applications on Java you must have JRE (Java Runtime Environment), JDK (Java Development Kit) etc. These components are not included in this IDE. And for using IDE for coding and running the program on java you must install it too.

For creating Application Server, Web Application, Batch Applications, Android Application you must download some libraries for specific environment. There are some platforms which includes these libraries: Java Platform, Standard Edition; Java Platform, Enterprise Edition; Java Platform, Micro Edition; Java Native Interface.

This IDE has a lot of features for writing, debugging, refactoring, analyzing and navigating project: completion code (Basic, SmartType), code generation, tips, features for finding and replacing anything you need, cool debugger and a lot of other features.

To make the writing of the code easier, almost every feature has hotkey and it helps to write more and make fewer mistakes.

Intellij idea is excellent for writing good code, with all its hotkeys and features.

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TRENDS IN THE DEVELOPMENT OF DATA CENTERS

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Due to the widespread emergence of high-speed Internet almost all of the physical resources of portable devices move to remote data centers. So recently, the area of data center is getting a lot of attention.

In the past, data centers were viewed just as a place to store data and ensure services for businesses. But in our time, the classic data center is over provisioned, underutilized, and almost ineffective. Budget constraints and compliance/risk factors are requiring organizations to reconsider data center strategy, because of enterprise data centers everywhere are almost reaching their limits in terms of power & cooling and physical space. Data centers have to meet the new market demands not only to overtake competitors, but simply in order to avoid equipment failures and serious problems in the near future. The most important trends in the organization of data centers were published in Gartner research.

Disaggregated systems. This approach is the opposite of integrated systems, in which the various components of the server are tightly packed on a single board, or even on a single chip. In fact, the idea of the world of free software, when, due to open standards everyone can create the necessary modules, has been moved into the world of hardware.

Earlier data backup plan was a compromise between reliability and cost of ready-made solution, but now customers want to be able to recover data from any point of time. In the future, the task of data backup and recovery completely fall on the hosting provider, and technology should provide continuity and seamless to the client of these processes.

Data Center Convergence. Servers that carry the main load of storage and processing of data were always included in a classic IT-infrastructure of the company. In this configuration of the infrastructure each company has an individual server, making this structure more expensive to service. The Future for converged networks, when the company has only client computers and standard network equipment which provide high-speed access to the Internet. All load of handling and storage of information is transmitted to the data center. In itself this infrastructure becomes universal, which provides additional cost savings. In fact, we are talking about the liquidation of the most expensive part of the IT-equipment in companies.

Virtualization can reduce the complexity of the system and significantly reduces the time involved with overseeing traditional server farms.

Data center position is very important. More geographies are available since operating staff is minimal because of virtualization. It means that decisions are driven by factors like: lower energy costs, lower construction costs, lower labor costs, and less population density.

Some scientists believe that soon some of large data centers will require its own power stations because of the increasing consumption of energy. It will relieve the power grid in the region where the data center is built.

The new trends in the area of data center signify a new era in development and management of data center. So in the future data centers should provide better performance, greater energy efficiency and actively implement technologies that reduce operating costs.

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HADOOP DISTRIBUTED FILE SYSTEM
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HDFS written in Java programming language is highly failover storage setup primarily aimed to deploy and run on cheap commodity hardware. It is very much appropriate for complex apps that deal with significant datasets (up to terabytes) and streaming admission with big capacity and scale to a great many of nodes in a single-link cluster. HDFS believes on the principle that on the chance of extremely dataset, moving computation is low-coster than moving data. Moving the requested computation, which is relatively much smaller than the data it requires to operate on, execution near the data minimizes the net congestion up to a great extent and thus enhances the productivity of the system in its entirety.

The HDFS is light portative to different platforms and is main-secondary construction. A main server called NameNode, and a multiplicity of secondary called Data Nodes, placed in racks, constitutes a typical HDFS cluster. The NameNode assists in file accessing by the applicant and also control the repository system namespace operation such as basic operations of operating system and accountable for blocks mapping to Data Nodes. On the other hand, the DataNode control the data repository in files and takes care of the read/write requests from the client of the repository system.

In this system, every file is separated by several parts and every of them is being stored in Data Nodes, which performs all basic operations of operating system. In a exemplary bunch, the NameNode is the decision maker for the block replications and obtain a Heartbeat and a Blockreport from each individual Data Node at a regular period. The Heartbeat specify about the Data Node's fitting functioning, while the Blockreport inform about all the units on that particular Data Node. The HDFS stores the great files across the multiple machines surely in a typically large cluster and each file is kept as a consistency of blocks, which in turn are replicated across other machines for the resiliency. The block size, replication aspect, and number of replicas are the configurable property.

HDFS is used as a bare base repository system by HBase Data model (Dimiduk and Khurana, 2012) alone doesn't observe much usage, but in a complex package, known as Hadoop, with other element, it potential is giant. Yahoo! Inc., Facebook, IBM, TIBCO, MetaScale, MapR Technoloies Inc. are some of the seller that either use or support it.

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5G TECHNOLOGY

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In the modern world the 4G telecommunication systems are developed with a rapid increase and used in many countries with modern technologies. That is why the market for consumers is necessary all the time to invent and apply new ideas to facilitate more rapid data transfer. Based on the above is easy to assume that the development of 5G technology carries quite interesting idea to translate customer requirements into reality.

Very soon 5G technology will become the new chief standard communication systems. This technology should be more modern and sophisticated than previous reference standards telecommunications. There is a likelihood that the 5G show itself closer in 2020.

Nowadays 5G technology is just beginning to develop but many can hear that this project is innovative because it contains in itself a creative sense.

Basic parameters for the standard 5G can be characterized by such criteria:

SUGGESTED 5G WIRELESS PERFORMANCE	
PARAMETER	SUGGESTED PERFORMANCE
Network capacity	10 000 times current network
Peak data rate	10 Gbps
Cell edge data rate	100 Mbps
Latency	< 1 ms

Almost every one of the largest telecommunications companies is working to introduce new standards of communication systems but not all standardization bodies actively engaged 5G.

Despite the fact that fully parameters needed to support performance 5G still unknown among standardization bodies, some telecommunications companies have done some work in this direction.

It is known that one of the greatest well known telecom companies Huawei currently makes large contribution into the development of 5G technology. This company is going to invest about $ 600 million in it.

Despite the fact that the concept of the 5G is still being developed, in the world of fast telecom evolution it is going to become reality soon. This new standard will bring telecommunication systems onto the totally new level.

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CROWDDB – HUMAN INVOLVED DATABASE SYSTEM

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CrowdDB can be understood as a database system, extended to human resources, that is capable to answer any query. There are situations, where it is too problematic and resources too resources costfull task for data base systems with usual architecture, but involvement of human greatly eases it. CrowdDB advises to harness the Human Computation to resolve this queries using crowdsourcing platform. The smallest queries in these systems are called microtasks. This platform facilitates the system which use work of

huge amount of people that via the internet. An example of such platform is Amazon's Mechanical Turk. Typically, AMT resolves such tasks which can be easily performed by people, but not by computing machine, for example find a series of images for presentation. A query can be written but truly, there is no good method in RDBMS to perform it correctly without knowledge about picture sense. This computer unanswerable query can be better resolved by the experts of the related field that having access to the web. The CrowdDB recognizes this need and appends the power of crowd to DBMS. The relational query engine expands to a small amount of requests for a human inputs through creating and submitting the task to a human based platform. Thus, collectively, human and computer function like a response machine, but not in their fundamental processing way. As an illustration, in a given scope, the terms I.B.M, IBM or "International Business Machines" belongs to the same facility, but a database system (computer) considers them three different entities and their mistaken assignment for one another will return erroneous results. On the hand, a human is capable to judge that all the three items refer to a single entity will help producing correct answers. Similarly, selecting the best images for a special representation, human expertise produces better results than computer. Thus, in CrowdDB data model crowdsourcing platform is the key component.

A crowdsourcing platform generates a marketplace where requester places the problem and based on their expertise, preferences, including the price of this job, the workers agree to execute the tasks. AMT is the leading platform that offers APIs such as createHIT (title, description …) to felicitate the entire process and provides microtasks. A microtask generally does not require any extra training sessions and use minuscule time to get completed, except the extreme cases that may take up to one hour or so for completion. Exclusively in AMT platform, the requester also specifies a price/reward (minimum $0.01) along with the task that, on satisfactory task completion, will be given to the associated worker and as of now, the payment mode is restricted to the credit card of the USA only.

CrowdSQL is a query language which actually is an extension over traditional SQL and supports crowdsourcing. The applications are available to be built in casual way; the underlined complications in dealing with crowdsources are dealt by CrowdDB. The CrowdDB accesses the local tables as the first attempt to answer the queries, then invokes crowd otherwise, storing the crowd fetched results in the database for future requests. In the figure, the left-side is the stack of the usual components of a traditional data model, which are extended here to facilitate the data management from the crowdsourcing. The component stack on the right side of the figure is the face, responsible for active interaction with crowdsourcing platform. The top component, Turker Relationship Manager, attends requester's duties that involve approving or rejecting assignments, payment, etc. HIT Manager mediates the interaction between the CrowdDB and the crowdsourcing platform. It also works with storage engine to save the crowd-obtained data into storage. To have full understating about the CrowdDB architecture, readers are encouraged to the read the related reference.

As mentioned above, CrowdSQL is a minimal extension of SQL that is capable to support crowdsourcing. The CrowdSQL queries are written in the same way as the conventional database queries and substantial part of the time, the user is unaware of the fact the query code include crowdsourcing.

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5G – THE FUTURE OF MOBILE WIRELESS COMMUNICATION NETWORKS
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Since the moment of introduction till present day mobile networks have come a long way of development; new types of user devices – smartphones and tablets have appeared. Opportunities, that mobile technologies offer today, have already gone far beyond voice services, creating new business models, new ways of communication and data sharing. Spreading of devices has led to the growth of network traffic around the world. However, this is only the beginning of the revolution, which promotes the active development of technologies that connect the society.

Technologies continue their development towards higher productivity and growing number of opportunities. The progress of modern networks is committed to ensuring that in future the access to data will be implemented immediately, and the provision of services will occur without delay and will not be interrupted due to an unreliable connection. The number of connected devices is growing rapidly. Providing this kind of connection − a task that must be solved by 5G technologies. Energy efficiency will also play an important role, it should be the main objective in the design of all 5G solutions.

5G is a combination of advanced models of wireless and additional technologies, the implementation of which is planned by 2020. Today the experimental elaborations are taking place. 5G technology is the most promising in the European Union and China. Because they are a very densely populated areas and the need for high-speed wireless Internet access there will always be very high.

This is a new stage in the development of technologies that will provide unlimited access to the network for individual users and devices. In developing of 5G standard, the advanced capabilities of LTE and HSPA, as well as other radio access technologies, focused on specific tasks, are being taken into account.

The distinctive features of 5G technology are: high speed data transmission, audio transmission without distortion and the signal of highest quality. The 5G standard is based on a wireless connection, as well as its predecessors. But at the same time it can transmit more than 3.6 Gbit/s, unlike the 4G, the speed of which does not exceed 1 Gbit/s.

A lot of studies were conducted in the development of 5G. The established consortium METIS (Mobile and wireless communications Enablers for the Twenty-Twenty Information Society) aims to develop fundamental concepts of 5G and plans to determine further ways of mobile communication development.

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METHODS AND MEANS OF COMPLEX CONTENT CREATION OF MULTIMEDIA PRODUCT
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Media in today's world is changing rapidly, so the informational resources based on the integration of technologies that provide active human impact on the data in real time is a

thorny issue. Multimedia is the very navigational structure that provides interactivity – the possibility of direct interaction with the software resource.

Relevance: Multimedia technology is effective due to its inherent qualities of interactivity, flexibility and integration of different types of information. Scientific and applied problems of developing methods and means to enhance the perception of multimedia information products is reflected in the growth in popularity, competitiveness, profitability and stability of undesirable impacts is relevant area of research in computer science.

Objective: To study methodology, methodological and technical issues forming multimedia news content.

Discussion. *Multimedia systems.* "Multimedia" – a special interactive technology, which provides the work with computer graphics, text, speech support, high quality sound, static images and video. A. Kapterev [2] explains that multimedia systems are divided into linear and non-linear categories. Linear active content systems are have no navigational control, for example, film documents and simple presentations. Nonlinear is a system in which interactivity is the mean of control in the working process, it is often used in computer games and educational complexes, hypermedia is an example of non-linear content.

Graphic information in multimedia. A. Krapyvenko considers image data streams that are common for working in multimedia systems, expanding solid-state graphics, animation and a combination of television and computer images [3]. This brings the real-time representation for the information the user deals with. Therefore, in terms of computer graphics the definition of realistic computer graphics appeares. Grafical multimedia technologies can be used when creating solid graphics, often with animations defined as realistic graphics, which is widely used.

Structuring information. To create a hierarchical description they use special data structures that allow to enter the chain of the description, submission and other objects; essential and non-graphical attributes that make a relationship with applied graphics algorithms. V. Dunayev notes that structured description is required when using computer graphics in an automated design, such a description in the system Satie, which is based on standard PHIGS (provides the three dimensional, structured, dynamic objects) [1].

The most common multimedia formats. AVI (Audio Video Interleave) is a format that allows you to record and store the digitized sound which is definitely positive quality if playback of stored voice messages is necessary; MIDI file format has a volume smaller than a file of digitized sounds of similar duration but it is not suitable for saving voice messages; SWF (Shockwave Flash) is a format which is is used for compressed vector graphics and animated vector objects storage.

Currently this format is one of the most widespread on the Internet. The file of this format contains all the necessary information for the user, and, despite its diversity, in one block; VRML is a language of virtual reality. To create objects in VRML different applications are required: for 3-D objects and controls space creation; for the code testing;for textures creation; for sound creation and software verification, optimization VRML code [4].

Conclusion.Thus, the media is an optimum combination of text, image, video and sound in one form. Multimedia and the Internet require a completely new approach to writing. The style which is suitable for "off-line world" is different from on-line. Unfortunately, most of the creators and designers of so-called multimedia systems believe that multimedia system can be named so if it has movement and sond in it.

There is no clear definition of "multimedia system" and often they create just an electronic information system with elements of multimedia. The true multimedia system must have, for example, audio controls, and convertation from text (visual) to text (audio) andand backwards.

While evaluation criteria and numerical coefficients of efficiency of multimedia products stay undeveloped, we can only use the following phrases that encouraging for mankind to use the multimedia: "it can improve the quality and speed of assimilation of information", "it provides additional information about the process", "in static form, this process can not be displayed" or "for people who do not see an effective method of providing information."

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MOBILE NETWORKS OF THE FUTURE

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We can't even imagine our daily life without such device as a smartphone. We can use a smartphone not only to call up and send messages, but also we are able to examine an e-mail, watch videos, listen to music online, gain an access to cloud storage of data etc. These new abilities of our smartphones require a high-speed, secure and the stable internet connection.

Let's look through an evolution of the generations of the mobile communication systems. The first generation is an analog system (1G) that identified the mobile communication systems and allows subscribers to call up without the possibility of moving during the call. The second generation of the digital communication system (2G) permitted to communicate at the time of moving, for example when you drive a car, and opened a new feature of mobile networks −data transfer (2,5G). Further technologies: 3G, 3,5G and 4G allowed increasing data transmission rate to 100 Mbit\s, while speed increased close to 300 km\h.

We can distinguish four main reasons for necessity of development of a new mobile communications standard:
− the further increasing speed of data transmissions;
− to reduce the amount of energy, which is used to ensure high speed of data transmission;
− to improve the safety of wireless connections;
− the idea of "smart" things, which is gaining popularity.

5G network will be no other than the global secure unified broadband data network. Firstly, fifth generation networks will be based on a new generation of LTE and Wi-Fi technologies. Secondly, there will be considerable convergence of these two technologies, the interpenetration of one technology into another. This will happen because most of contemporary smartphones have a chip that allows working in a cellular network, and the chip, which allows working in the Wi-Fi network.

Potential technologies and the principles of evolutionary transition from 4G to 5G can be grouped in four directions:

1. **New air-interfaces, methods of transmission and reception:** new methods of multiple frequency shift keying; technologies of noise coordination on the basis of perspective methods of reception.

2. **New network architecture:** creation of the ultra-dense networks on the basis of small cells by the principle "one point 1Tx/Rx on one subscriber"; the centralized architecture: Cloud Radio Access Network (RAN) on the basis of SDR and Coordinated Slow Central Controllers; in CDN-based cloud basic CN networks; multivariate MIMO antennas; evolutionary MIMO technologies: active / the 3D - the antennas MIMO; physical division of traffic and control between management planes and data transfers.

3. **New principles and conditions of a range using:** use of the new ranges: from 6 to 60 GHz; flexible sharing of the frequency resources.

4. **Smart and adaptive communication networks:** use of mobile applications with possibility of their optimization for reduction cost of a radio access; distribution and resource management of heterogeneous networks; network interconnection of different technologies of a radio access; the self-setting-up and self-optimized networks.

Thus, the worth of the project of creation of new mobile communication 5G generation consists in implementation of the large-scale projects in the ICT area. This project has important social and technical meaning, which promotes an acceleration of receiving and information transfer.

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SOFTWARE DEVELOPMENT METHODOLOGIES
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Methodology is a complex of principles, ways and methods which define software development. It is a division of software development work into distinct phases or activities with the intent of better planning and management [2]. Nowadays there are many successful methodologies for creating software. Selection of specific methodology depends on team size, complexity of a project, stability of a company, personal traits of employees etc.

The most general classification divide methodologies into two branch [1]:

1. Predicted methodologies: all tasks and goals are scheduled only once. It is difficult to make changes during development.

2. Adaptive methodologies: focus on constant changes in a project, but nobody can predict terms and result.

Of course it is necessary for modern software to be adoptive. On the other hand, all companies wish release their product faster than competitors. And in the following text will be described the methodologies, which try to find 'golden mean'.

1) Scrum

Scrum is an agile method for project management developed by Ken Schwaber[3]. Every day a brief daily meeting (called a scrum) is occurred, at which progress is explained, upcoming work is described, and obstacles are raised.

A key principle of Scrum is its recognition that during a project the customers can change their minds about what they want and need (often called 'requirements churn'), and that unpredicted challenges cannot be easily addressed in a traditional predictive or planned manner[4]. As such, Scrum adopts an empirical approach—accepting that the problem cannot be fully understood or defined, focusing instead on maximizing the team's ability to deliver quickly and respond to emerging requirements.

2) Microsoft Solutions Framework (MSF)

The Microsoft Solutions Framework (MSF) is an adaptable approach for successfully delivering technology solutions faster, with fewer people and less risk, while enabling higher quality results[5]. MSF helps teams directly address the most common causes of technology project failure — improving success rates, solution quality, and business impact.

MSF focuses on:
− aligning business and technology goals;
− establishing clear project goals, roles, and responsibilities;
− implementing an iterative, milestone/checkpoint-driven process;
− managing risk proactively;
− responding to change effectively.

Key elements of MSF discussed in this article are:
− the msf foundational principles and mindsets to orient and guide teams and team members how to work together to deliver a solution;
− the msf team model enables projects to scale, ensures teams meet a variety of stakeholder needs, and defines goal-driven roles and responsibilities;
− the msf governance model (formally called the msf process model) drives fast, high-quality results through a proven project life cycle that identifies key project activities.

Dynamic Systems Development Method

DSDM (Dynamic Systems Development Method) is a robust Agile project management and delivery framework that delivers the right solution at the right time [6].

For many years DSDM has been the leading, proven Agile approach, providing governance and rigour along with the agility and flexibility demanded by organisations today. The approach is the culmination of practitioners' experience drawn from a wide range of public and private sector projects over nearly two decades.

The DSDM Philosophy is that any project must be aligned to clearly defined strategic goals and focus upon early delivery of real benefits to the business. DSDM is vendor-independent, covers the entire lifecycle of a project and provides best practice guidance for on time, in budget delivery of projects − with proven scalability to address projects of all sizes and for any business sector.

DSDM advocates the use of several proven techniques, including:
− facilitated workshops;
− modelling and iterative development;
− moscow prioritisation;
− timeboxing.

In conclusion, it should be said that nowadays project manager has rich selection of development methodologies, and if they know about most of them and are interested in new, they can easily make best decision according to team ability and project requirement.

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MONODEVELOP

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Today one of the most effective and practical programs for creating cross-platform apps is MonoDevelop. It is a free developed environment, which enables its users to save their time and money resources and it fits both for devices on iOS, Android and Windows Phone 7 platforms.

At large this creation was designed for C#, but it is also suitable for such apps as Boo, C, C++, CIL, D, F#, Java, Oxygene, Python and Vala. The main purpose of Mono is not only to support Microsoft .NET programs, but also to develop better tools for Linux. It allows programmers to write desktop and Web applications on Linux, Windows and Mac OSX very quickly. MonoDevelop has similar features to those of NetBeans and Microsoft Visual Studio.

This free and open source project is led by Xamarin Studio. The first platform based on Internet standards appeared in June 2000, after Microsoft had made its official announcement.

Xamarin offers a rebranded version of MonoDevelop 4.0 as Xamarin Studio.

For each platform, Xamarin provides an opportunity to use native UI design tools and the native user interface elements. For Android creating UI may occur directly in the code, or by using declarative approach interface description into XML. For iOS it is also a code, or the use of the native interface design tools – separate xib-files or one big Storyboard. Editing these files is in a familiar iOS-developer environment XCode. And that means that you will need Mac.

Limitations of Xamarin.iOS are mainly associated with the fact that iOS, as mentioned above, unlike the .NET and Mono has no virtual machine. Therefore, there are difficulties with the support of Generic. The reason is clear. The compiler has got the task to analyze the code and identify all the possible concretizations in this or that class or method.

MonoDevelop, and later Xamarin is part of Mono.

The Mono C# compiler is considered to have features, which allow to run C# 1.0, – C# 6.0 (ECMA). A prerelease version of C# 6.0 is distributed with Mono 3.8 or when building Mono from our trunk source code release. Mono's current modification is 3.8.0. It has 711 commits since the last release.

Mono Runtime supports infrastructure intermediate language CLI (Common Language Infrastructure), corresponding to the standard ECMA-335. The virtual machine

execution environment allows the ability to run applications and assemblies compiled in other systems (for example, possible to run on Linux without having to recompile the application by using Microsoft Visual Studio for execution in Microsoft Windows).

Also, instead of using a virtual machine, runtime can be integrated into the application to create an embedded system that requires no installation Mono to run and has a high speed. Thus, in the application includes only the necessary components of the execution environment.

In the environment of Mono the Ahead-Of-Time (AOT) compiler of the intermediate language is implemented. The purpose of this compiler is to reduce the startup time and optimize the code by compiling the CLI intermediate language into machine code. Analogue in the Microsoft .NET Framework is a utility Ngen.

Mono has both an optimizing JIT and interpreter runtime. The last one is less complex and it was used on the first stages, before JIT became current. The interpreter is not supported where the JIT has been ported.

With the help of Mono a great range of different programs and virtual simulators were developed, including video games such as The Sims 3 and Second Life's scripting language, LSL, OpenSimulator virtual world server. Games built with the help of the Unity game engine also make use of Mono.

Today Microsoft has released the Roslyn compiler project to the public, under the Apache open source license. The compiler's visibility should lead to improved benefits for all regardless of their platform. (The Mono project's CLR allows non-Microsoft platforms to run the code produced by Roslyn.)

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THE KNOWLEDGE REPRESENTATION MODEL OF SCIENTIFIC PORTALS

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Nowadays a huge amount of information is represented in the Internet; and the major part of this information is becoming almost inaccessible due to the ineffective work of search systems. It is considered effective to create scientific knowledge portals that can provide the access to the resources of a certain subject field in order to increase the effectiveness of search in the Internet. Such portals development can facilitate the request time and reduce the number of output resources by means of accurate definition of their relevance degree and reference storage at knowledge portals.

The research has shown that ontological models are used to represent knowledge at portals. Some scientists consider ontology to have a special conceptual "semantic" essence. Ontology is a conceptual system that is put forward as a background for special basis of knowledge. Other scientists interpret ontology as a special semantic subject. In this case, ontology is a representation of conceptual scheme of logical theory, its vocabulary or specification [1].

Each knowledge portal can have a hierarchical or net structure, i.e. it can consists of more specific portals that are connected by some kind of relations, for instance, 'general-specific'. Such architecture makes a knowledge portal flexible and easily extended. The basis for knowledge portals are the ontologies that contain the description of typology and coherence of relevant resources.

Picture 1 shows the structure of a proposed knowledge portal. Its main components are ontology, a collector of ontological information about resources, a request constructor and an answer composer. Let us consider them in details [2].
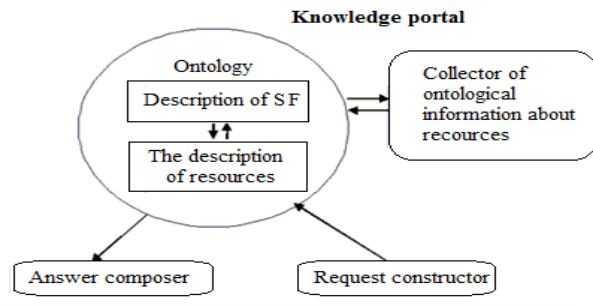
Pic. 1   The sructure of the

Ontology. The ontologies of knowledge portals include both the description of subject field (SF) and its relevant resources. The description of subject area consists of a cluster of terms and relations that are semantically meaningful for a given subject area as well as rules according to which one can construct the notions about the elements of SF. The description of net resources includes the list of page and site references and specification of links among them.

Using standardized mechanisms of search, the ***ontological information collector*** consistently processes references to documents, webpages and sites identifying their subject, structure and relevance degree between the subject and the information that is included there. The data received are accumulated into the ontology. The collector must analyze new sources and check the old ones.

An answer composer. Processing the resources, an answer composer traces the degree of their relevance to the notions and gives the list of the most suitable for these notions resources.

A request constructor. A knowledge portal has a request language that is close to a natural one. It requires some availability of relevant linguistic maintenance and one of its basic element is the dictionary of terms that is intrinsically connected with ontology.

In order to describe a source language, which is close to the natural one special thesaurus of Alex system is used. In this dictionary one can find all possible term inclusions (words and phrases) of specific subject areas in the form of hierarchical lexical patterns; this way it becomes possible to request terms not only in Russian but also in other languages. Hereafter, this hierarchy of notions can be used for the integration of thesaurus and notion ontology into one whole knowledge network. The advantages of such approach is considered in the research [3].

In conclusion, ontological models enable to organize a high-quality search and navigation through the information space of knowledge portals in different subject fields.

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QUANTUM COMPUTERS
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The purpose of this article is to introduce to quantum computing and describe quantum computing problems. Quantum computer is an computational device which is able to operate with qubits. The main principles the work of quantum computer is based on are superposition and entanglement. Unlikely usual digital computers, quantum computers operate with special bits which are presented as superposition of two classical states – 0 and 1. So n qubits together (qubit register) represent a superposition of 2^n states. Quantum computers are similar to probabilistic computers because they operates with multiple states at the same time which have some probability, so the result of calculations will be also probabilistic – some states will be more probable than other states. Of course, the result will be determined with probability equal to 1 – but only after measurement. We cannot know determined result before we make measurement. Qubit register sets the basis whose state dimensions count equals to 2^n and the basic basis is known as 'ket' and is created by 3 qubits.

One of the main problems in construction of quantum computers is quantum decoherence. Quantum decoherence is loss of coherence of the part of quantum computer. This is needed to minimize connection between parts of quantum computer and outside influences. These factors can be even caused by physical implementation of qubits: lattice vibrations and background nuclear spin of the physical system used to implement the qubits.

Usages of quantum computers. Quantum computers allow to resolve a wide scope of tasks. For example, cryptanalysis, NP-complete tasks and other tasks which requires a lot of computational work of classical digital computers. It were developed a large number of quantum approaches to create calculation devices. These are: array of qubit quantum gates, array of one-qubit measurements that are applied to a highly entangled initial state, adiabatic quantum computers, topological quantum computers. All four models of computation have been shown to be equivalent; each can simulate the other with no more than polynomial overhead. There is Quantum Turing machine theoretically important but implementation of this model is very difficult.

Quantum computers cannot solve all the problems that dig ital computers cannot, but the give more powerful abilities in solving calculation problems. For example, it allows to solve BQP problems (called, "bounded error, quantum, polynomial time"). BQP scope may intersects NP-complete scope and contains P-complete scope of tasks. So it is possible to solve some NP-tasks by using quantum approach.

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INTEL REALSENSE 3D CAMERA
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3D photos are coming to smartphones tablets and personal computers, and this time, it actually works.

The RealSens family developed by Intel is software and depth cameras enables intuitive and more positive cooperating with personal computing instruments. Cutting-edge facial detection and emotion detection, tracking, depth-sensing, 3-Dimensional scanning, Chroma-key, the following of twenty two joints in each hand for exact touch-free gesture recognition and photography are all made possible with RealSense Technology.

Redefining how you manage your instruments, the Real Sense 3-Dimensional Camera enables new methods to interact in content production, amusement and even in games. Featuring full HD color and a best in class deep sensor, the camera give personal computers and tablets 3-Dimensional vision for new, spectacular practice. Interact more by the light of nature with facial confession, feeling following, 3d-scanning, and background Chroma-key, or use ten-finger gesture recognition for live instrument control.

The RealSense camera has active-pixel detector as well as an infrared one, plus a micro-mechanical implement that projects an unseen model of glow across a scene, to help measure depth. The system also includes a new chip from Intel – it's not an Core or Atom a processor, it's a very particular CPU we've cultivated for this product.

There are two variant of apparatus: a rear facing model and a front facing model. The first is consigned for all in ones and laptops, to be used for movement distinction or for video conferencing – having the profound information means you can cut the background, so that callers see only person without impression; quite handy for when you are leading a meeting at home rather than the work.

The RealSense camera can also make video-conferences more amusing: it will be able to extract bodies and faces and lay on them in other backgrounds, much as video-programs do with green-screens and Chroma-key. Intel has affected a deal with Microsoft and Skype users with RealSense cameras can cut all the background during a video-conference, leaving only a person's body in view. Intel has achieved a twin deal with Tencent, which has eight hundred million users for its conference service.

Little people turn to vigorous students in gaming based on studying with sign, sounds, and touch identification. Scholastic is cooperation with Intel to plan interactive studying tools. Depth-optimized software enables children ages three and up to engage via arm and hand motions to boost tomorrow's core literacy and studying skills.

The mechanism would allow users to scan an facility and move an figure on their screen using hand gestures before printing it out using a real-printer.

People will scan an object from three hundred sixty degrees using a specially-adapted camera, which the firm says will fit into the slimmest of tablets.

Tablets and laptops are only the beginning. Intel's RealSense camera has big future for science and technologies.

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QUANTUM COMPUTING
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Quantum computers are completely new and an entirely differend kind of computer. Quantum mechanics surfers to the behavior at the most basic parts of our world – the fundamental elementary particles that make up the universe. These elementary particles do not act in the same way the world around us does. They're totally different properties. Sometimes particles can react in totally unpredictable ways. If we take these properties at the quantum world and enlargement work now classical world we can take advantage of them. Conventional computers work on transistors. A transistor can be in two different states of one or zero. These numbers are known as binary digits or bits. Quantum computers work by taking the properties of quantum mechanics and applying them to computers instead of using transistors to compute data, quantum computers use quantum objects as a special kind of transistor known as a quantum binary digit or qubit. The quantum object can be a number of different fundamental particles, the only requirement is that the quantum object behaves in laws of quantum mechanics. This is the reason why quantum computers are so different compared to classical computers. These computers use special strange properties of the quantum world. The first strange property of quantum mechanics is superposition. Superposition is a very odd quantum phenomenon in which an object is in more than one state at the same time. If you flip a coin there are two possible outcomes – heads or tails. Before the coin lands we don't know if it's going to be heads or tails, so simply in the quantum world it would be both. Once it lands and we observe it, it will be one or another, but before that it is a mothball states, a superposition. Quantum objects behave in almost the same way the flipped coin.

The real purpose of quantum computers is to increase computing power. With one regular bit we have two possible states – 0 or 1. When we have two regular bits there are four possible states 00 01 10 and 11. The computer outputs only one of those variants. When we have two qubits there are the same possible states. But with superposition each qubit can be in combination of both 1 and 0 state. This causes quantum computers to be much more powerfull than classical computers. This means with two bits a classical computer will output a two bits of information. With two qubits, because they can simultaneously be in the 1 and 0 state it will contain four bits of information. Therefore when more qubits are added the output will grow exponentially. This means even a simple quantum computer can be more powerful then our current supercomputers.

But there's a big problem using superposition in computing. When qubits can be in multiple states at once, only one of those states can be observed. This means that a quantum computer can compute many different things at once but only one of those thigs can be outputted. This means the computer will choose the best variant output. The problem with quantum computing lies in engineering. Quantum computing is all about taking the microscopic world and getting it to control our macroscopic world. Microscopic world is very finicky, hard to control and almost impossible to predict. But if we can harness power

of the quantum world, quantum computers will change the future, allowing us to do things that would never be possible with classical computers. The strange properties of this special computers will open up a whole new world of computing. So quantum computers are very complex machines and we still have a lot to learn about them, but it's totally worth an effort.

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APACHE HADOOP CLUSTER AUTOMATED DEPLOYMENT
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The problem, which many developers face, as they want to implement enterprise usage of on Apache Hadoop, is how to deploy and configure Hadoop framework on a big quantity of hardware. Let us get some numbers. Facebook has a cluster, which consists of 1400 computers, and LinkedIn has 4100 nodes in it [1]. Besides, installing and configuring Apache Hadoop on a single computer is a very painful process, which takes days for an experienced administrator to set it up, and weeks for a beginner. This means that experienced administrator would spend at least 4100 days to configure LinkedIn cluster, which is approximately 11 years. Which is hardly imaginable, even if we increase the number of administrators, we cannot get good terms.

To solve the problem stated above, there are two automated systems. They are CDH4 made by Cloudera, and Apache Ambari made by Hortonworks. CDH4, at the time of writing the article, provides much less flexibility and functionality, than Apache Ambari [2]. Due to this, the rest of the article is devoted to Apache Ambari usage.

Apache Ambari workflow consists of three stages:
− Bootstrapping the nodes
− Deploying Apache Hadoop
− Monitoring of Apache Hadoop

Bootstrapping the nodes installs instances of Apache Ambari on all the nodes, which the user specifies, using SSH protocol and the secret key provided by the user. The above instances are called Ambari Agents, and are the clients of Ambari Server the only instance of which can be run at a time. Ambari Agents are used for deploying Apache Hadoop on every single node, and for further monitoring of the node and Apache services statistics.

Deploying Apache Hadoop, which is the second stage of Apache Ambari workflow, is preceded by choosing the Apache Hadoop services, which the user wants to install, the mapping of this service components to the specific hosts, and by the configuration settings of every chosen service.

Making the process as easy as possible, Apache Ambari provides an appropriate default values for most of the configurations, which can be changed before or after

deployment. After customizing all the above information Apache Ambari starts deploying Hadoop service components on all the nodes, by triggering corresponding actions on Ambari Agents. The process takes up to 40 minutes, which is incredibly fast for a Hadoop deployment to be done [3].

After the deployment is done, the third Ambari workflow stage comes in. It is the monitoring stage. Making the life of administrator as simple as possible, Ambari does 90% of monitoring work instead of administrator, showing tones of useful information about the Apache Hadoop services and cluster nodes state, and alerting the administrator in case something goes wrong.

Information about the cluster in shown with the help of visual metrics, Ambari alerts mechanism, which includes about a hundred of alerts [4]. Every alert is checking a certain harmful situation, which can happen on every node of the cluster. If this situation occurs, it shows the corresponding information to administrator, which in that case can quickly react and fix it, until it causes trouble.

Taking the above into consideration, we can increase cluster deployment efficiency drastically. Firstly, by increasing the deployment time itself and reducing costs of it. Secondly, by reducing costs of post-deployment monitoring and increasing efficiency of it.

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UNITY 5 INNOVATIVE FEATURES
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Unity − a tool for the development of two- and three-dimensional applications and games running under Windows and OS X. By using the Unity applications run under the operating systems Windows, OS X, Windows Phone, Android, Apple iOS, Linux as well as game consoles, Wii, PlayStation 3, PlayStation 4, Xbox 360, Xbox One. You can create Web applications using a special plug-in to a browser Unity, and by the experimental realization of the module within the Adobe Flash Player. Later Flash support declined. Applications created with Unity, support DirectX and OpenGL. Actively engine used by developers Indie-games. Due to the presence of free version, user-friendly interface and easy to work with engine.

One of main Unity five features is realtime lightmap samples. Together with many other market software leaders, new Unity just presented development platform to supply you with builtin UI realtime lightmap previews and samples based on Imagination's inovative feature PowerVR Ray Tracing technology (PVRTC). This amazing functionality gives opportunity for almost instant feedback from modification to 3D word illumination lightmaps by rendering an precise preview in IDE UI scene view of how game of shadows will look while playing game. Using this feature, designers are able to develop level by level while level lightmaps refreshes automitically in the background, significantly decreasing the time required to make best look-and-feel adjustments.

Antoher outstanding Unity 5 addition is Unity Cloud. New game engine will also note the release of the Unity Cloud network that will enable mobile developers to open in fullscreen intermediate ads in their portable games, as easy as change ad units with the rest of Unity developers. This is going to open access to the abilities of more that 500 millions game installs.

Sound behaviour has been changed dramatically too. Unity 5 sound behaviour was re-developed to fit requirements of flexibility and efficiency. The main advantage added with the sound re-development is an Audiomixer (AM) developed to provide complex realtime routing and effects application. Sound specialist can take sound smaples from AM settings for dynamic transitions between sound profiles while playing 3D game.

For interested in WebGL support Unity provides add-on access. Probably crossplatform functionality is still those most important aspects. Unity five started a teamwork with Mozilla partners to deliver WebGL features in line with asm.js javascript library. In Unity Engine 5.0, programmers will have early access to WebGL add-on developed by Unity community and start creating hi-end games with no plugin required.

Realtime Global Illumination with Enlighteen. By active work with number of partners Unity is now able to integrate Enlighteen – cutting edge technology for realtime illumination in 3D world. Enlighteen is the unique illumination technology tuned to provide 100% dynamic shadowing and lightning on any mobile, portable or standalone computer.

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ROBOTICS IN THE FUTURE

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Robotics (from the robot and Technology) − applied science, which develops automated technical systems and is an important technical basis for the intensification of production. Robotics is based on disciplines such as electronics, mechanics and computer science. Allocate the construction, industrial, consumer, aviation and extreme (military, space, underwater) robotics. But a full answer can be found in the exhibition of modern robotics and advanced technology, which will be held October 24-25 in Moscow. It was there that robotics will be presented in full, which it is known today.

For the first time the word 'robotics' was used in print by Isaac Asimov in 1941. In the history of robotics declared itself long ago. Known, for example, a mechanical dove Greek mathematician Archytas of Tarentum, he built around 400 AD Some robots are designed not only to help people, but also for entertainment or for the purpose of extracting commercial profits. Robotics felt a significant breakthrough with Jacques de Vakansonom, who in 1737 created the first operational humanoid robot.

Time for the success of mechanical assistant's man came in the XX century, and, as often happens in our lives, the emergence of a new type of mechanisms implemented initially in fantastic literature. It is a Czech writer Karel Capek in his popular science play «RUR» (Rossum's Universal Robots) in 1923 used the word 'robot' that has penetrated into

all the languages of the world. The action takes place in the future where robots were created to perform hard work. Over time, the development of robotics has gone up and robots become more intelligent, got the ability to make independent decisions, reflections, and also aware of their physical and mental superiority over man. As a result, the war was declared to all mankind, robots defeated and destroyed all life on the planet.

In the middle of the XX century appeared the first functional robot. George Devol and Joe designed a robotic arm controlled by an electronic controller.

To date, the development of robotics has reached such proportions that the robots are already able not only to move independently, but also to play various musical instruments, carry loads and climb ladders, depict animals, participate in the rescue of people in emergency situations, to collect all kinds of rock types on Mars.

The successful development of robotics has two goals correctly: further increase production of robots and simplify their operation. Addressing these goals is interconnected primarily with significant increased rates of sensitization and intelligent robots.

Now the future of robotics, you can imagine how harmonious connection sensitization program and intelligent robots that provide more complete satisfaction of the needs of society. But to predict the development of robotics, robotics and artificial intelligence for a long period with good accuracy is not yet possible.

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CSP – NEW OLD APPROACH FOR BUILDING CONCURRENT SYSTEMS
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Concurrency is an ability of computer system to perform several computations simultaneously. Computations can be performed on single CPU, on different cores of single CPU, or physically different CPUs. Computations in concurrent systems can communicate with each other thereof the number of execution paths can be extremely large and the result of computation can be undetermined. The usage of shared resources in parallel is one of the reasons of indeterminism, which can lead to problems such as dead locks and starvation.

To address these problems several mathematical models were implemented such as actor model, Petri nets, PRAM etc. This article describes ways for developing robust concurrent applications on top of CSP concurrency model.

Communicating sequential processes or CSP is formal language that describes interactions of processes that run concurrently [1]. It was described by Tony Hoare in his paper by the same name in 1978. However, talking informally, CSP is a concurrency model where processes communicate by message passing via channels. Common example of applications built on top of CSP are applications with client-server architecture. In such case there are two processes (client and server) that are physically decoupled and communicating using messages sent over network (usually using TCP or WebSocket protocol). Instead of physical decoupling, advanced CSP toolkits allow programmers to logically decouple their

programs so there are set of processes/workers that can be executed and communicating on same physical machine.

Modern incarnations of CSP include Go programming language and core.async library for Clojure programming language. These toolkits have several common traits among which are:

− first class channels: channels are data objects that can be passed, processed and returned from functions;

− light-weight processes/workers: usually programmer can spawn thousands of processes and this will not cause performance degradation due to usage of green threads (Go) or fixed thread pool (core.async);

− dealing mostly with asynchrony (e.g. letting slow operations like retrieving data from database or network connection to run while main program does other work), not parallelization.

Go programming language or golang was initially developed by Google and was presented in 2007. It's imperative, compiled, strictly typed language with garbage collection and some dynamic typing features. Go is compiled directly to the native code so there are several possibilities for Go programmers such as launching Go applications on "raw metal" and embedded development with Go. The main feature of the language is *go* statement that starts new light-weight process or *goroutine* [1]. In golang channels are type and thread safe, buffered queues for communication between goroutines. However, the preferred concurrency model in golang is communicating-processes, memory can be shared between goroutines and standard *sync* package provides lock and other concurrency primitives.

Clojure's core.async is another implementation of CSP concurrency model. It is external library and is not part of the language. As soon as Clojure is hosted language (so it is compiled not to native machine code), such feature allows to use this library on every platform that Clojure supports [2] (among which are JVM, CLR, and JavaScript VM). Because JavaScript doesn't support multithreading by design, core.async provides imitation of threads for JavaScript and allows to avoid "callback hell" using channels instead of callbacks. Core.async library is in early development state so there are some not fixed problems such as: not informative error messages, absence of consistent error handling method, absence of debugging toolkit. But even with this problems core.async library has achieved popularity which is growing daily.

Nowadays IT is a field that is developing extremely rapidly and intensively. This demands stable, error-free software that is developed in short terms. Wise usage of CSP paradigm can help programmers to address these requirements by decoupling their programs into set of processes that are independent of each other. As result programs become more robust, easier to debug and modify.

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RANDOM FOREST ALGORITHM
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Algorithm "random forest"− a technique by which you can achieve high accuracy in classification and regression with minimal configuration parameters.

In this method, a classifier model is constructed using the training sample, which is constructed on the basis of a large number of independent decision trees. Trees are created so that for each tree, instead of considering all possible nodes, the analysis was performed for a small group of randomly selected nodes. In this case, for each tree, for subsequent analysis selects the best leaf. Classification occurs voting or averaging the results for all trees.

Randomness in this method is present in the choice of examples from the training set for building decision trees, as well as in the choice of sites for which the algorithm will operate each particular decision tree.

Classification accuracy in the method 'random forest' depends on the number of decision trees, as well as their mutual correlation. That is, in the ideal case for each column, we have to build a large number of independent decision trees. If the efficiency of each particular decision tree drops or increases their dependence in this case is reduced and the classification accuracy of the method. In the case of the algorithm 'random forest', the independence of decision trees is achieved through the randomness in selecting examples from the training set and at random in choosing for each node of the tree on which the analysis is conducted.

The method of "random forest" has many positive features: parallel operation, high precision, fast learner, and a tendency to a lack retraining.

Also, its positive feature is that it shows the high quality headings for training samples, with a small number of examples. This feature distinguishes the method of "random forest" among many other algorithms and is extremely valuable for the successful application of machine learning methods.

Classifier learning algorithm.

Let the training set consists of N examples, the dimension of the feature space is equal to M, and is set to m. All trees are constructed committee independently by the following procedure.

Generate a random subsample of size n with the repetition of the training sample. (Thus, some examples will fall into it a few times, and approximately N/3 examples should not enter into it at all)

We construct decision trees, classifying examples of this subsample, and in the course of creating the next tree node will choose a sign on which we partition, not all of the signs of M, but only of m randomly selected. Selection of the best of these features may be implemented m a variety of ways. In the original code used Breiman Gini criterion shall also apply in the algorithm for constructing decision trees CART. In some implementations of the algorithm is used instead the criterion of growth media.

The tree is built up to the complete exhaustion of the subsample and not subjected to the procedure of pruning.

Classification of objects is performed by voting: every tree committee considers classified objects to one of the classes, and class wins, which was voted the greatest number of trees.

The optimal number of trees selected in such a way as to minimize the error of the classifier on the test sample. In default, minimized error estimate out-of-bag: the proportion of examples of the training set correctly classified by the Committee, if we ignore the voices of the trees on the examples within their own training set.

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3D PRINTING
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To anyone who hasn't seen it demonstrated, 3-D printing sounds futuristic – like the meals that materialized in the Jetsons' oven at the touch of a keypad. But the technology is quite straightforward. It is a small evolutionary step from spraying toner on paper to putting down layers of something more substantial (such as plastic resin) until the layers add up to an object. And yet, by enabling a machine to produce objects of any shape, on the spot and as needed, 3-D printing really is ushering in a new era.

3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file. The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the entire object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object.

3D printing turns computer models into real physical things. It takes different materials, from biodegradeable plastic filament PLA to ABS plastic to Nylon, melts it into thin layers onto a surface, moves up and prints another layer. After layer upon layer, you are left with a physical object. It all starts with making a virtual design of the object you want to create. This virtual design is made in a CAD (Computer Aided Design) file using a 3D modeling program (for the creation of a totally new object) ór with the use of a 3D scanner (to copy an existing object). This scanner makes a 3D digital copy of an object and puts it into a 3D modeling program.

To prepare the digital file created in a 3D modeling program for printing, the software slices the final model into hundreds or thousands of horizontal layers. When this prepared file is uploaded in the 3D printer, the printer creates the object layer by layer. The 3D printer reads every slice (or 2D image) and proceeds to create the object blending each layer together with no sign of the layering visible, resulting in one three dimensional object.

Not all 3D printers use the same technology to realize their objects. There are several ways to do it and all those available as of 2012 were additive, differing mainly in the way layers are build to create the final object. Some methods use melting or softening material to produce the layers. Selective laser sintering (SLS) and fused deposition modeling (FDM) are the most common technologies using this way of printing. Another method of printing is to lay liquid materials that are cured with different technologies. The most common technology using this method is called stereolithography (SLA).

In fact, 3-D printing technology is advancing at a staggering rate. American designers are now working on 3-D printed cars, while in China and Holland, 3-D printers are building entire houses. The first 3-D printed hamburger was recently created in England, heralding the possibility of a man-made food supply.

Boeing, GE and other industry leaders are manufacturing state-of-the-art aerospace equipment with the new technology, while NASA, using Zero-G technology, is demonstrating how 3-D printers will one day be used in space.

Perhaps most dramatic are the advances being made in the medical field. Research and development of 3-D printing-based medical techniques have already saved countless lives and opened the doors to previously unimaginable possibilities in medicine.

Everyday, more people have access to 3D-printing technology thanks to the open-source hardware DIY clubs, hacker and maker spaces and Maker Faires that popping up in cities around the globe. Good international examples are Wevolver in London and Amsterdam, the FabLabs, and the more recently, the 3D Hubs network, which grew from connecting a couple of hundred 3D-printers to more than 7,000 in less than a year's time.

Easy access to top class 3D modeling and design apps and software like 123D Design (available for PC or Mac, iPhone and iPad or through a Web application) makes it accessible for many people to start printing in 3D in their own neighborhood.

More 3D-printing marketplaces and Service Centers are being opened everywhere by entrepreneurs betting on a lucrative market to explode the next years. Shapeways and Maker6 are pioneers in this area in the US, while iMaterialise is well-known in Europe (Belgium).

Some of the big players are already positioning towards a 3D-printing consumer boom as well, such as the recently launched Amazon's 3D-printing Store or the UPS Store's in the US. With effects on energy use, waste reduction, customization, product availability, medicine, art, construction and sciences, 3D printing will change the manufacturing world as we know it.

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PAIR PROGRAMMING

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Technique when two programmers work at one PC called pair programming. This way of developing applications or other software products, is part of extreme programming. First person writes code – this programmer called driver, while second, the observer, verifies the code and check for errors. This programmers change roles often (for example each hour). It helps to improve the quality of the generated code and productivity.

The observer also comes up with different versions of the algorithms and solutions of the problems. It helps the driver to focus on writing code. Here some advantages and disadvantages.

Advantages:

− Satisfaction: Most of the programmers get more pleasure from work when they work together. Also, more than 90% of programmers feel more confident in their decisions when working in pairs.

− Teamwork: It makes possible to solve problems quickly. Therefore, each member of the team understands the code that was written.

− Save money: writing code in a pair takes more time, but the quality of writing code much better. It helps to save money on support and debugging software product.That's why pair programming significantly reduces field support costs and quality assurance expenses by reducing the defects in the programs.

− Learning: Pair programming allows you to learn and improve the level of knowledge, because the partners share their experience.

Disadvantages:

− One partner may withdraw from the keyboard to respond to email or even fall asleep.

− Lack of communication between programmers or conflicts.

− When one member of the team is more experienced than the other, then a junior programmer can simply watch, relying on a senior member of the pair in most solutions.

− So, pair programming improves the quality of code, increases knowledge, but also increases time for implementation of the solutions. Also, for good productivity you need to choose the right partner. Pair programming is integral part of this agile software development.

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BIPEDAL LOCOMOTION OF ROBOTS

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Biped locomotion has been known for a long time, but some real progress for robots was achieved only in past twenty years. There were many approaches to create a good model of walking: static and dynamic walking, CPG method.

Static walking was first of them. This approach assumes that robot must be in stable position, at any time, even if all motion is stopped. But this idea was abandoned, because it works only for flat surfaces and robot's speed was too slow.

Second approach is dynamic walking. It allows the center of gravity to be outside the support region for limited amounts of time. Dynamic walking robots are not determined to be absolutely stable. They can be designed to recover from different kind of instabilities. This kind of robots can be faster and use rough surface.

Central Pattern Generators (CPG) have been identified in most animals as being responsible for generating periodic signals that excite motion muscles. They can be

mathematically formed by a set of coupled oscillators, when they are configured properly these oscillators generate the complete walking pattern. They can also generate different types of walking, i.e. jumping, crawling, running etc.

The newest progressive step in biped locomotion are presented by using learning algorithms and neural networks. Using these methods, constructors do not need to know the exact dynamic model of robot, it can find solutions by itself and can adapt to surface changes.

Process is based on the idea, the controller has a specific task. If it succeeds in accomplishing it, it receives a reward (additional point to its rate), if fails it receives a punishment (negative points). Then the controller learns, trying to avoid actions that yield punishment and to find actions that lead to success. This method is related to the theory of optimal control and dynamic programming, and even to the psychological study of classical conditioning.

Sometimes the success or failure of the controller is determined not only by one action but by a succession of actions. The algorithm must distinguish good actions and reward them accordingly. This is referred to as the problem of delayed reward. There are two main methods that can gain results in solving this problem, Q learning and TD learning. These methods build function that computes how close each state is to be expected. Whenever the controller outputs an action, the system moves from one state to another. The controller parameters are then updated in the direction that increases the state value function. When the action space is discrete, the implementation of this method is easy and straightforward. When the system must pick an action from a fixed set, it picks the one that has leaded to success more often. But when the action domain is continuous, the problem is not obvious. Statistical gradient following methods have produced some promising results. These methods generate the action using a random number generator with a Gaussian distribution. The network weights are updated toward the direction that yields higher reinforcement points. As a result, the mean converges toward an optimal action and the standard deviation is increased when the system needs to search the action space, and converges toward zero once an optimal action policy has been learned.

The introduction of learning and neural networks to biped locomotion has shown better results than conventional control methods. Indeed, it is difficult to accurately model the dynamics of a biped and to find analytical control rules that will solve stability and nonlinearity problems. Furthermore, if one agrees with the concept that trying to mimic animal behavior is the most promising direction in robotics, then learning and adaptation, central pattern generation, pattern recognition, and modularity are the main directions to be focused on.

Neural networks have a huge potential in a field of biped locomotion. They have shown a good ability to adapt, resistance to noise and robustness in both nonlinear and linear control problems. Now these methods have two major obstacles: need for memory space and computing power. If scientists overcome this problem, it will result in making robots humanlike.

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OPTICAL CHARACTER RECOGNITION

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Have you ever tried to read your friend's handwriting? It may be a bit hard, may not it? Good you're not working for US Postal Service which has to recognize and deliver thousands of handwritten envelopes every day! With that level of computerization of our lives it is very important for computers and humans to understand each other well. Until now, we had to use relatively limited input devices like mice and keyboards, but nowadays we have new ways to communicate to computers, one of them is touchscreens. Touchscreens allow us to tell some text to computer without typing it. You can just write needed words or symbols using touchscreen, and your phone or computer will try to understand your input – this is one of the applications for **optical character recognition (OCR)**. Another example of OCR usage is when you have to digitize a handwritten letter or a printed book. So, OCR is a special type of software that performs automatic analysis of a printed or handwritten text and can convert it in a form that computer understands and processes more quickly. Digitized version of such texts allows editing, searching, analysis and even translation. Modern OCR applications also support detecting of non-textual information like columns, text formatting, images and so on.

Let's look at one more real life example: let's suppose we have a hundred of boxes filled with documents and we need to find the ones with a particular person's name in it. What are the solutions? You could just pay someone to look through all these documents and tell you if something has been found. Notice that there is no guarantee that during this boring process a person will not miss needed pages.

In this case OCR helps a lot. After all the pages have been scanned you pass the scanned images to appropriate recognition software and here you go – you have all that information from your documents in real text format, you than open search dialog and search what you need. Looks simple, but from inside it is rather difficult.

To perform recognition OCR program must be presented with the source information, which is typically some kind of a picture with text in it. The problem is that computer doesn't understand that there is a text, like human does, for computer it is just a bunch of meaningless bytes, which make no difference with, for example, someone's photo. Optical characters recognition is used to make computer understand that text and save it in a computer-readable form.

OCR technology is an important one. It helps us communicate with computers in a more comfortable way. Besides writing on a touchscreen you may want to turn your favourite old book into a digital copy or quickly extract information from the business card. This technology is also used to help visually impaired people by reading out text from device's screen. With computers getting more and more powerful recognition becomes a lot faster, so that you don't have to wait several minutes for the computer to recognize one page – few seconds is all you need.

Let's have a closer look at how it works. Let's suppose we have a single letter written (or printed) on a page, the task for the OCR software is to tell us what is written on that page. Will you think that is easy? Yes, for human, but for computer it is a tricky task. The problem is that every person can write any of the letters in a slightly different way, or, if it is printed, the problem may be in different fonts that are used. Text formatting can make some difficulties for the recognition too.

There are two techniques that are used by OCR software. First one tends to compare symbols entirely (pattern recognition) and the second one provides recognition by detecting

the key parts like strokes and lines, that the symbols are made of - this one is called feature detection and is used by most modern applications.

Pattern recognition tends to compare written letters with already known letter images. This technique is successfully used in recognizing things like checks, passports, invoices, bank statements and receipts, as in these cases it is possible to use special OCR-fonts that help software to recognize symbols using this method.

Feature detection (or intelligent character recognition, ICR) is a much more advanced technique of detecting characters. This way software uses set of rules like "*If there is one vertical line and one horizontal line on top, than it must be letter T*". Applying that rule will result in recognition of most capital letter Ts, independently of the font that is being used.

$$1 + \ulcorner = T$$

In mobile applications, however, a slightly different rules can be applied, because in this case additional information like drawing direction or the languages that are used is known. To improve recognition efficiency different dictionaries and analysis tools are used. Generally, any contextual information is very useful in terms of character recognition. When it comes to really difficult tasks neural networks are usually used, these are also called intellectual recognition systems.

OCR technology is not perfect. The accuracy of the recognition can be very high only if the source image is clean and clear, perfect accuracy can be achieved only after human inspection of the results. Also, there are issues with the recognition of handwritten texts (especially if there are lots of different symbols). These problems are under active development now. Different artifacts on the source image, like coffee stains or inkblots can dramatically decrease a chance of successful recognition. For example, at some stage of text recognition the black-and-white version of the source image is generated, and if there is an artifact it will also become black-and-white and it will be really hard to distinguish it from actual text.

OCR will become even more important in our future, because electronic books are becoming more and more popular and humanity will need a way to turn all those huge libraries of printed books into digital content that is well understood by computers. Besides that, turning a printed book into digital one brings many advantages like fast search, fast navigation and editing, and the most important – it allows transmission across the Internet, so that everyone can have a look.

After all, as you can see, OCR is far from perfect, especially when speaking about recognizing handwritings or documents (especially old) with some artifacts. That is why, you should not completely rely on computer, so that reading through results and checking for errors will still be quite useful.

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FUTURE OF THE PASSWORD
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In the modern society everybody had to deal with memorizing useless strings of rand om characters called computer passwords. But how did they appear to exist, what's their purpose and what to expect in the nearest future is what I would like to talk about.

Passwords have been following humanity during all it's being – from ancient times and to nowadays. Encryption keys were widely used during World War I and World War II to protect vital pieces of intelligence. But when did the first digital password appear?

In the middle of 1960s the Massachusetts Institute of Technology was developing the huge time-sharing computer technology called CTSS. CTSS technology is a direct ancestor of the well-known modern technologies like: instant messaging, remote devices controlling, file sharing, parallel computation etc. But at the start of computing era, passwords were rather smaller and easier to store than the alternative. The irony is that the MIT researchers who pioneered the passwords didn't really care much about security.

Since the sixties technology evolved, but then again – it didn't. Different variations of encryption protocols and authentication methods appeared, but from the user's standpoint nothing changed: you still need to remember a set of characters, which is your password. This principle was getting old and the technology was compromised by numerous exploits, like bruteforce and collision attacks, Biological Engineering and other reasons like a human factor.

In the meantime, software giants like Microsoft, Facebook, IBM and Google introduced several new methods of authentication, which are already implemented and used in some of their products. Among the most interesting ones are biometric authentication, RFID passkeys and graphical (or associative) passwords.

Biometric authentication consists of user's ability to prove his identity either by giving his fingerprint, iris scan, voice or by passing the face recognition. Some of these techniques are old, but were only accessible to various nations' security agencies due to expensiveness of the equipment involved. But in present, where technology is getting cheaper and more fast-evolving, these trends are making their way into the public. As an example – most of the mid- to high-end notebooks already contain the ability to perform so-called "Face Logon".

RFID (Radio Frequency Identification) is considered relatively new technology, but in the core lies all to familiar radio communication between «passkey» (RFID chip) and the receptor (computer). Many companies already use it in their products. Among the biggest ones are passive (signal-powered) RFID chips in VISA cards and electronic payment systems ("digital wallets") in many modern Android-powered mobile devices. In the future we may see such devices as RFID passports and biomedical implants with user's medical records.

Graphical or associative password authentication is one of the most interesting technologies developed recently. Associative password systems have been researched for many years and were developed to overcome the common problem with memorability and strength.

Graphical User Authentication (GUA) commonly works by user picking a sequence of pictures, where each picture is randomly selected from certain categories. Each item has a set of META-tags, which is then combined into a pattern. To make sure that the pattern is correct, user has to pass at least several selection screens. The advantage of this technique is that people don't have to memorize the exact sequence of pictures, but select the familiar pattern in more intuitive way.

Graphical passwords may offer better security than text-based passwords because many people use plain words (rather than the recommended jumble of symbols). A dictionary search can often hit on a password and allow a hacker to gain entry into a system in seconds. But in the case when the series of selectable images is used on successive screen pages, and if there are a lot of images on each page, a hacker must randomly try every

possible combination. If there are around 100 images on each of the 8 pages in an 8-image password, there are 1008, or 10 quadrillion possible combinations that could form the graphical password! If the system has a built-in delay of several milliseconds following the selection of each image until the presentation of the next page, it will take not one million of years to break into the system by hitting it with random image sequences. But there is a major weakness in current graphics-based password programs, whether self-drawn or computer-generated, people keep picking the most obvious choices.

In conclusion I would like to add, that regardless of which technology takes place of the text-based password – the change is imminent and unavoidable by the reasons stated earlier. In my opinion the future of the User Authentication will be full of wonders, with artificial intelligence recognition systems, which will behave like human recognition does, and motion-based passwords. We'll never know what to expect, but I am sure that the real security of users is somewhere within our reach.

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NODE.JS

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JavaScript is one of the most popular programming languages now because almost all web project using it. JavaScript – prototype-oriented scripting programming language. Is a dialect of ECMAScript. The first realization of JavaScript lived in internet pages. This is just defines what you can do with the language, but it does not say much about what the language itself can do. JavaScript is a complete language: you can use it in many contexts and achieve everything what you want with it.

Node.js (or Node) actually is just another context: it allows you to run JavaScript code on the server side. In order to execute the JavaScript you intend to run in the backend, it needs to be interpreted to a bit code and executed. Node.js use the V8 Virtual Machine from Google. This is the same runtime environment for JavaScript that Google Chrome uses. Node ships with many useful modules, so you do not have to write everything for yourself. One advantage of the Node.js is the possibility of developing only one implementation of the application rather than a plurality of browsers and their various versions.

The technology has been conceived as a platform for creating applications that focus on high intensity of input-output and low intensity of mathematical calculations. That is even more important, Node provides this functionality in a fully finished form. You don't have to worry about that that the application will block the rest of the work while it wait for the download complete or any interactions with the database. This is because most of the functionality applies to asynchronous input – output. Also, the application is running in a single program stream.

Technologies that develop around Node.js are quite fresh and full of life; there are always new options and updates. The technological base has reached a sufficient level of maturity that ensures that time will be spent on the study of Node not for nothing.

It is necessary to remember two important circumstances during the work with Node.js. Firstly, JavaScript is the basis of Node. This is the same programing language that is used to develop scripts on client-side. Secondly, Node.js is a server technology, which means that some functionality that is expected in the browser is not necessary. However, you need a lot of new and potentially quite unknown abilities.

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PROSTHETIC HANDS

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Foreword

Every day happens in the world might be a lot of injuries, the effects of which should be amputation. According to statistics upper limbs, suffer most of all the whole hand and its closure, phalanges, which substantially alters a person's lifestyle.

Main part

Prosthesis – a system of medical and technical organizational measures aimed at restoring the lost forms or functions of individual organs or bodies themselves. There are two types of prosthesis, namely mechanical prostheses, electronic solve two problems simultaneously: social and work.

Bioelectric prosthesis contains electrodes that read action potential produced by the muscles at their contraction, and then pass it to the microprocessor and cause the prosthesis into action. Prosthesis functions as a rotating brush, the capture and retention of subjects.

As for today's time engineering prosthetics is gaining popularity, allowing people to return to their previous way of life. Leading companies for the production of prostheses are "RSL Steeper" (Great Britain), "I-Limb Ultra Revolution", "Dapra" (USA), Italia's company "Prensilia", "Avatar" (Russia) but the main winner in features most similar to the function of the human hand is Bionic 3.

Russian hand is ready and at first driven it will elektropolimernye muscle by Swiss production. In 2011, the prosthesis received from 15 to 20 degrees of freedom. The company delivered the task ahead of the development of the western countries in this regard. In the near future we plan to make a hand controlled by thought.

Western countries are not only to realize it with the help of muscle action potential that is to establish a direct relationship of the brain with a hand, but also feedback. Yes, now you can not only control the limbs, but also feel like a touch, the force of impact on the hand, and temperature. This is done with the help of microprocessors and infrared diodes that detect any changes in the surface, digitize them and pass to special conductors, and they in their turn to the terminals, which are connected to the sensitive nerve endings. Thus the

brain (the sensory area of the cerebral cortex in rhesus monkeys) receives the signal-information about a particular change.

Fingers can perform all movements as in the present human hand plus the developers have added one more – this is turnover hands around its axis. The price of such a bionic arm in 2014 ranges from $ 70,000 to $ 110,000, a jump in price has the effect of design and functionality.

In the majority of the material from which the prosthesis is made, are various alloys of titanium and carbon; it all depends on the point of use the hands in the sport, in war or at home. You can choose not only the material, but also a hand. It is possible to order the hand that will be covered with special elastic material, which is by its physical characteristics almost like real leather.

Among the many advantages there are also disadvantages – such as psychological discomfort. Lack of tactile sensitivity in any prosthesis prevents perceive them as part of themselves. It is also difficult to feel dangerous temperatures, weight and strength necessary to hold this or that subject.

Conclusion

Since ancient times, people were deprived of their limbs is due to illness, punishment, in wars. All this has a negative effect on the way of life that has stimulated the development of prosthetics. First dentures were made with ill-hewn wood, which provides a great disadvantage in their application. But were the years and this branch has not stopped developing were used and injuries requiring amputation and prosthetics did not end. Later used the iron prosthesis. on the basis of various alloys. They were very heavy and cumbersome. With the coming of the 20th century and the development of electricity, new ideas in the manufacture of artificial limbs appeared.

Concluding, we can say with certainty that the bionic (miostimulyator) prosthesis is a major breakthrough. According to statistics, three out of ten people wear dentures, whether tooth, jaw or prosthetic limbs.

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MULTITHREADING, MULTIPROGRAMMING OR PARALLELING IN COMPUTER LIFE

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Despite the widespread and exclusive support for multiple platforms, parallelism model that is based on the flow of the operating system, has some fundamental flaws that make it difficult to write correct and scalable parallel applications.

First of all, only the lowest level of abstraction for data exchange between tasks performed in parallel – shared state – is available to programmer. In addition to work with data, each task must make efforts to coordinate it's work with other tasks. The main problem here is that the programmer has to describe logic and coordination very precisely, which creates a semantic gap between human and computer program ideas. This gap impairs the readability of the code and eventually leads to errors in the program (according to race (contentions, races), mutual locking (deadlocks), poor scalability).

Secondly, in Windows operating systems family the cost of new thread initialization is unreasonably high. This makes it impossible or impractical to partition program on a large number of parallel operating elements. But a significant number of programs (web-based applications, real-time, etc.), by contrast, require simultaneous launch of many performers. So here we see the semantic gap that forces the programmer to maintain manually the mapping of logical threads into physical low level representation. This leads to difficult decisions such as model Fayber SQL Server, where every missed detail can be disastrous.

One thread – a single unit of code execution. Each thread executes instructions of sequentially process to which it belongs, in parallel with other threads of the process.

It is necessary to discuss separately the phrase "in parallel with other threads." That is, a single processor can process commands only sequentially one at a time (in the simplified case). However, running multiple concurrent threads is possible in systems with single-core processors. In this case, the system will periodically switch between threads, giving alternately performed to one, then to another thread. This scheme is called pseudo-parallelism. The system remembers the state (context) of each stream before switching to another thread, and restores it to return to the implementation flow. In the context of flow options are included such as a stack, a set of values of the processor registers, address, executable commands and stuff .

Parallel programming is used to create programs that effectively utilizing the computational resources due to the simultaneous execution of code on multiple computer nodes. To create parallel applications using parallel programming languages and specialized systems support parallel programming, such as MPI and OpenMP. Concurrent programming is more complicated than the sequential writing in code or in its debugging. To facilitate the process of parallel programming, there are specialized tools such as the debugger TotalView, static code analyzer VivaMP.

The scientific potential of the country is largely determined by the existence of her supercomputers. The notion of a supercomputer is a relative concept. Characteristics of a supercomputer correspond to the characteristics of ordinary computer. Today's supercomputers have the performance, measured in petaflops (1015 floating point operations per second). By 2020 it is expected that the performance of supercomputers will rise in 1000 and will be measured in ekzaflopsah. And that's why having a high performance, you need to use The parallel is being computed. Parallel computing can reduce the execution time of the program.

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CLOUD STORAGE TECHNOLOGY AND OVERVIEW OF ITS USAGE
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Cloud storage − model of online storage where data is stored on multiple servers distributed in network provided for clients usage, mainly by the third party. The data is stored and processed in a so called cloud which from the point of view of the client

represents one large virtual server. Physically these servers can be located on geographical distance from one another, down to the location on different continents. You can put your files there and get access to them anywhere and anytime.

In this article, we are going to discuss several options of cloud storage data usage.

Examples of cloud storage usage:

1. **Synchronization of files between multiple devices.** It helps to implement automatic data synchronization between different computers and devices of user. It provides availability of relevant information on any of your devices. If you work with some documents and place them into the "cloud" you get access to them from any of your computers or mobile devices.

2. **Creation of your files backup.** It is required to provide durable extra storage of your data. For example, you have an archive with a certain set of documents for a project on which you were working one year ago. This information is important to you and you may need it anytime, so keeping it only on your personal computer is rather dangerous. A simple hard drive error can lead to complete data loss. To reduce the risk of such a loss you can make a backup of your files which will be stored on your cloud. You can also back up your current projects. When you are working with large data volume projects, in which there are a lot of constantly changing files, creation of a daily backup is a real necessity for you. You can use file synchronization with your cloud storage on a schedule or at your request data archive may be copied to the cloud automatically.

3. **Portable programs installation.** It is very comfortable to create the folder "Program Files" in the cloud storage and to install portable-version of programs which you use very often. This refers to Windows-based programs. As you may know, portable-programs are designed for program run from any portable device such as USB flash drive, these programs don't have installer and are always ready to use on any of your computers. All you need to do is to insert the flash drive into the USB port of any computer and launch a portable-program you need. The same can be done in the cloud storage. All computers connected to this "cloud", will automatically set the required program and with settings you need.

4. **Placement of private information.** It is very comfortable to store your personal data on your "cloud" when you easily need to get access to the storage from any computer and anytime. For example, you can put there a list of passwords for websites, your book of contacts or even your personal finance and banking information. In addition, it is very convenient to store passwords for sites there. There are several ways to store such data in encrypted form.

5. **Files exchange between multiple users.** It provides a common or restricted access to your files. You can create a special link which any user can follow and where he can copy your personal files with open access or upload his own files in your private containers and folders. This feature can be useful for sharing large files between individuals, as well as for users situated in different parts of the world.

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SOFTWARE INTERFACE FOR DATA EXCHANGE BETWEEN MS SP ELECTRONIC DOCUMENT-MANAGEMENT SYSTEM AND 1C: ENTERPRISE SOFTWARE
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Nowadays there is an urgent problem for data exchange between electronic document management system and automated accounting systems. The most popular electronic document management system is Microsoft SharePoint, and the software for bookkeeping - 1C: Enterprise. However, there is no free and flexible solution. The problem is in development and creating a set of software tools for data exchange between Microsoft SharePoint electronic document management system and software product 1C: Enterprise.

There are lots of systems exchanging date using web-services technology. This is useful as the need is only in installing an extension of web-interface and data handler for host database and client solution just has to connect to web-service. The technology is portable and the use of it is very actual currently.

There are some examples of web-services use WSDL description:
− The Central Bank, for receiving daily data.
− Yandex for checking orthography.
− Aviation statistics for monitoring flight information, weather, etc.

Based on the above, there is a need to set up software could use web-services that could be written using WSDL.

As a programming language it is advisable to choose language C #, as it provides opportunities to develop a variety of applications, including add-ins to Microsoft SharePoint.

As a development environment the most suitable is Microsoft Visual Studio 2013. The framework should provide tools by virtue of which the process of application development becomes much faster, easier and more reliable.

There are some of them:
− visual designers for Windows Forms with elements of controls of drag;
− optimized code editors that include operators completion, syntax checking and other features IntelliSense;
− built tools of compiling and debugging;
− tools for simplifying interaction with Microsoft Office.

As an API for data the authors were asked to choose SOAP-protocol, as it can through standard means of 1C: Enterprise create a web-service. If you choose COM-connection, you need to create a third-party non-trivial application for transferring and converting data. There are several main phases of software interface for data exchange between electronic document systemamoyu Microsoft SharePoint and automated accounting system of the 1C: Enterprise:
− Create and publish web-services in the 1C: Enterprise.
− Creating a site collection in MS SharePoint. The next step will be a creating sites family in MS SharePoint. Sites family – a group of web-sites with common top-level site owner and administration settings, such as permissions. When you create a web-sites family it

automatically creates a top-level site. The following top-level site can create one or more subsites. Sites families hosted in web-applications. A web-application can contain several families of sites, but a single family can be placed in a single web-application. Before creating websites family you need to create a web-application [1].

− Make a list, content types, custom field types. Type of content – a collection of metadata (columns) that provides for the re-use workflow, behavior and other settings for a category of items or documents in MS SharePoint list or document library. Content Types allow you to manage settings for categories of data centralized manner with the ability to reuse [2].

− Connecting to the web-service. The next step is the creation of a new empty Visual Studio project for MS SharePoint. After creating a project loaded wsdl-file 1C web-service from the site 127.0.0.1/CustomService/ws/ws1.1cws?wsdl. Using Visual Studio Tools "svcutil" from the downloaded file is generated .Net-library that provides an API to the web-service 1C: Enterprise.

− Development of web-service for Microsoft SharePoint to transmit and receive data.

− Design forms to create list items to be transferred to the 1C: Enterprise.

− Scripting programming language JavaScript Development of forms to open the dialog box.

− Create VisualWebPart in Microsoft SharePoint to display taken with 1C: Enterprise data.

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3D PRINTING
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Not too long ago, instant implementation of the idea into real thing was impossible. New technologies appear in our life every day, whereas decades ago they were only in books. Nowadays, computer technologies allow not only printing some pictures or text on paper, but also produce a three-dimensional object. It is called a three-dimensional printing.

Three-dimensional printing is a method of prototyping (creating prototype, the model of the object), which allows 3D printer to create a physical object layer by layer using a mathematical model that has been developed in the special CAD-program (computer aided design program).

The idea of three-dimensional printing was brought into the life in 1986. The method, that is called stereolithography (SLA), produces models, prototypes, patterns and production parts by curing a photo-reactive resin with a UV laser or another similar power source. The industry of the 3D printing has developed since that time.

The main area of using 3D printing is an industrial production. 3D printing greatly reduces the manufacturing cost and increases the speed of creation prototype. Producing physical object allow to study the shape of the object and its properties, which are incomparably better than the most detailed image on the screen.

Another application of 3D printing is related to the production. For example, company makes a design of a complex model for plastic parts. The company can quickly and cheaply stamps its products by massive printing of this model. This method is very common in the production of toys, especially plastic figures.

Finally, the most attractive, but still pretty fantastic area of use is a home production. It is useful, because no one will refuse the opportunity to "print" at home a cup or a plate for breakfast and a couple of door handles for repairing. Nowadays enterprise-class 3D printers cost more than 2 000 $.

The full process of creating a three-dimensional object consists of a few steps. Firstly, 3D model is created by CAD package or via 3D scanner. Then the model should be converted into series of thin layers. After that another specialized program produces a G-code file containing instructions tailored to a specific printer. The 3D printer follows the G-code instructions to lay down layers of liquid, powder, paper or sheet material to build the model from a series of cross sections. Finally, operator of 3D printer should clear the model and inspect it by all kinds of tests.

3D printing is a new age of technology and science. For example, aviation and automobile industry have successfully used prototypes of parts to study aerodynamics, durability and interoperability of product parts and design of new models. People have already created a variety of useful things for different parts of their life. In addition, 3D printing products may reduce the environmental impacts of manufacturing by reducing usage of material. Unfortunately, 3D printers are still expensive to have one of them at home.

It's hard to imagine how our life will look like in 5 or 10 years, when anyone will be able to create basically anything they want or imagine, print it at home and use it straightaway

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ENCRYPTION AND QUANTUM COMPUTING
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The economy of up-to date world is kept on the statement, that encryption is indestructible. Therefore cryptography is quite powerful thing, when people use it properly. If somebody is trying to break an encrypted data it may last very long period of time.

Nowadays it is really hard to crack encryption algorithm, no can do it. Their safeguarding is based on algorithm − specific approach, which can take much time. Let`s exemplify the serve of a 128-bit AES cipher. If computer-breaker has not necessary material of origin of the key (for example, people often like to use key as names of their domestic animals), so he needs to take a candidate key until he will find the exact key which is worked.

We can figure out the quantity of candidate key with 128 bits. This quantity is 2 elevated to the power of 128, which is equivalent to 3.4x10^38. Even though he possesses enough computing techniques, which can discover exact key from 1 trillion keys per second, the act of discovering all candidate keys would take up 10/79 quintillion years. Although (such case was happened) it might find a necessary key within 5 minutes.

There are two variations of encryption algorithms, utilized in enterprise-level data transfer safeguarding: asymmetric and symmetric. Algorithms of symmetrical type are usually utilized to dispatch barely the confidential facts, while asymmetrical type is utilized to dispatch both data and secret keys.

When a person wants to dispatch the secret data to other receiver, so he should maintenance following terms: sender and receiver should use the identical encryption key and the same algorithm.

Nowadays there are a great number of symmetric algorithms. The most applying is the Advanced Encryption Standard (AES). AES can utilize the following types of keys: 128 or 256 bits long. For all the history of existence of this algorithm nobody could break it. AES is approbated for sensitive U.S. government information.

The only imperfection of this algorithm is that the sender must give the exact key to the receiver. If computer-breaker gains this key, so the following transfers will have not security. That`s asymmetric algorithms come in. Asymmetrical cipher has two definite keys: the public and the private. The private key is the deciphering key and the public key is the encryption key. For instance, if Jane wants to send a letter to another person Mary, she must know Mary`s public key. So only Mary can decode Jane`s letter because she has the private key to utilize it.

In Jane`s turn she utilized the public key, but this key can decipher it. The encryption innovation is a one-way function, which is inconvertible while the decipher has a necessary right part of knowledge indeterminate to other users of all over the world.

The most known asymmetric algorithm is RSA. In is a short name of a creators second names` letters: R- Ron Rivest, S- Adi Shamir and the last A – Len Adleman. Its safety is based on complicated math problems as factoring different numbers, from which the two keys were generated. Some time ago letters encrypted be RSA algorithm with keys 768 bits long were decoded. Therefore RSA began to utilize keys that are from 1,024 to 2.048 bits long.

Another different method to raise safety of asymmetric program is utilizing elliptical curve algorithms. This algorithm is founded on the math utilized to describe the formulation of the curves. EC may submit the same safety with one-fourth the computer-oriented complicity of RSA. But, EC encryption up to 109 bits has been cracked. Quantum computers could crack this smart sphere of cryptography. The procedure of key-cracking both RSA and EC keys insert in the identical mission – discovering structure in tremendous numbers. The principal idea of a quantum computer is utilized the features of quantum mechanics to search for structures within a tremendous number by trace of examination each number in that digit at the same time.

This preference of a quantum computer allows it to break a key that utilizes the asymmetric algorithm like RSA or EC scarcely at once. The issue of discovering a structure for an EC key with definite number of bits in the key for a standard PC would take a number of steps equal to 2 increased to one-half N. As an instance, if your key consists of 100 bits long, this procedure would take 1.125 quadrillion steps. But quantum computer is capable of doing this mission much faster, it should take about 50 steps. It take a risk of all asymmetric system, as key-cracking wouldn't be no more computer-based demanding than the initial encryption procedure.

Tackling resembling issue for RSA is more difficult that with EC encryption. In needs more steps for tackling through standard PC, but the scale of renovation with quantum computer should be similar.

The condition for symmetric encryption is a quite better. The procedure of cracking a symmetric cipher as AES needs discovering all eventual key combinations for the one that right. 128 bits long key has 2^{128} eventual combinations. But a quantum computer search big numbers, only the square root of the number of combinations requires to be investigated – in this case, 2^{64}. Anyway this number is big for quantum computer.

There has been vast progress in quantum computer processing during several years. For the last 15 years, scholars have studied to create quantum logical gates. So they look forward to create a quantum computer within 20 years.

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BIG DATA
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Big Data is a set of approaches, tools and methods for processing structured and unstructured data with huge volumes and significant diversity in order to receive results perceived by the human. As defining characteristics for Big Data, "three V" are pointed: *volume* (in the sense of magnitude of physical volume), *velocity* (in the sense of growth rate as well as need for high-speed processing and receiving results) and *variety* (in the sense of possibility to simultaneously process different types of structured and semi structured data).

Why did data become big?

There are many sources of big data in the modern world. That can be continuously incoming data from the measuring devices, streams of messages from social networks, meteorological data, data streams about location of subscribers of cellular networks, audio and video recording devices, etc. As a matter of fact, the mass distribution of technologies mentioned above and of fundamentally new models of using various devices and internet services was the starting point for the penetration of big data in almost all spheres of human activity. First of all, in research activities, the commercial sector and public administration [1, 2].
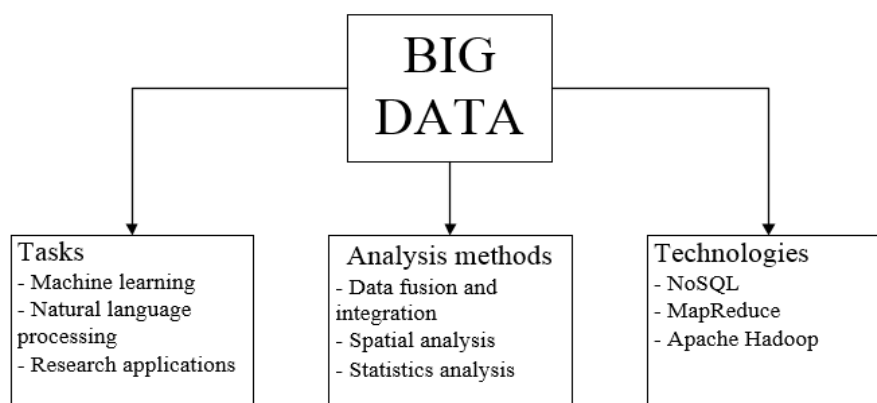
Apache Hadoop – it's a set of open source software for the development and execution of distributed applications processing Big Data, that run on clusters with hundreds or thousands of nodes. Apache Hadoop is successfully used in science and various industries. Research applications include mathematics, physics, high-energy astronomy, genetics and oceanography. Starting as a computing platform for search engines, Apache Hadoop is being used to store data, behavioral analysis, crypto analysis, meteorology, spam detection, processing of natural language, gene analysis, image processing, etc. In addition,

it was used to implement search and content mechanisms of many heavy websites, including Yahoo!, Facebook, Last.fm and eBay.com [3, 4].

Also Apache Hadoop was used to calculate two quadrillionth (10^{15}) digit of π, which was zero, and to help IBM's Watson won the TV show Jeopardy [5, 6].

Based on the ideas contained in two articles published by Corporation Google Inc.:

1. The Google File System – proprietary distributed file system GFS, is designed for distributed applications that process large amounts of data (order of hundreds of terabytes) [7].

2. Map Reduce: Simplified Data Processing on Large Clusters – distributed computing model used for parallel computing on very large (several petabytes) data sets in computer clusters [8].

The technology of "Big Data" is particularly flexible, highly scalable, and is using cloud technologies. Key role in processing and storing large amounts of data belongs to the analytical tools and techniques, such as real-time monitoring, predictive modeling and use of visual data panels. The main feature of used approaches is possibility of processing the information array entirely to obtain more reliable results of analysis.

As a result of use of Big Data technology, the organization has the opportunity to receive important information in a few seconds allowing to increase the efficiency of economic decisions, to respond faster to changes in customer behavior and to identify market trends at the earliest stages in real time.

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THE TACTILE USER INTERFACE

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Humanity has evolved a boosted capability to sense and manipulate the material world, but today the Graphical User Interface (GUI) takes small privilege of this human potential. Presently progress doesn't stand still and 2D technologies gradually become outdated. The relay passes to full three-dimensional realization.

A Tangible User Interface (TUI) forms upon our agility by symbolizing numerical data in physical space. TUIs magnify admissibility of physical items, surfaces, and spaces so they can livelihood straight engagement in the digital world. Though, TUIs ought to partial capability to change the form or properties of physical objects on the go. This limitation can lead to unpredictable behavior upon the digital models.

Constructing a tangible user interface (TUI) is a complex process that implicates multidisciplinary knowledge including computer science, art, and social sciences. Successful design depends on many factors involving material form, social settings, and aesthetics, in addition to well-designed software and electronics.

Meanwhile the development of Durrell Bishop's Marble Answering Machine (1992) two decades ago, the attentiveness to TUIs grownup continuously and per each year more touchable systems are appearing. In 1999 Gary Zallewski patented a system of portable kids' blocks holding measuring devices and displays aimed at teaching spelling and sentence structure. A comparable system is being promoted as "Siftables".

The Tangible Media Group developers from Massachusetts Institute of Technology presented a prototype of the analog inFORM interface which can present any 3D – object in the form of a set of little square columns.

InFORM device is a table with 900 columns of square sections, each column is connected to the separate drive. The computer, connected to the device, breaks it into a set of small platforms and transfers from each of them to the drive while processing data of any 3D object. As a result the rough projection of the processed model or array of data on an inFORM table is created.

Besides, the user can project any image on the created landscape from columns with the help of light. In addition analog interface can process and display in real time data received from the sign control device such as Kinect.

InFORM creators believe that analog interface possibilities could be useful for working with geographic data and maps. Another example is a visualization of planning or designing of architectural and industrial objects. Also, it can be used for educational purposes.

InFORM is the first step towards three-dimensional interfaces development as well as improving information technologies. It's easy to imagine various furniture with ability to change shape, or apartments with a dynamically generated environment.

Nowadays it's impossible, but the foundation is already laid and in near future the technology is going to be developed.

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PARALLEL COMPUTING IN PRACTICE
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Parallel computing is the way the organization of computing in which programs are designed as a set of interacting computational processes running in parallel (simultaneously). The term encompasses the totality of the issues of concurrency in programming, as well as the creation of effective hardware implementation. The theory of parallel computing is a branch of applied theory of algorithms.

There are various ways to implement parallel computing. For example, each computing process can be realized as a process operating system or the computational processes can also be a set of threads of execution within a process running. Parallel applications can physically performed either sequentially on a single processor – alternating turns performing each step of the computational process, or in parallel – highlighting each of the computational process, one or more processors (or close to the distributed computer network).

In the design of parallel programs the main difficulty is to ensure the correct sequence of interactions between different computational processes, as well as the coordination of resources shared between processes.

In some systems programming parallel data transfer between the components is hidden from the programmer (e.g., using a mechanism promises), whereas in others, it must be specified explicitly.

Explicit interactions can be divided into two types:

− Interaction through shared memory: on each processor multiprocessor system runs a thread of execution, which is owned by one process. Threads communicate through a common process for the memory area. Number of flows corresponds to the number of processors. The streams are created either by means of language (for example, Java or C #), or by using libraries explicitly (for example, C / C ++ using PThreads), either declaratively (e.g., using the library OpenMP), or automatically integrated by means of the compiler (e.g. High Performance Fortran). This kind of parallel programming usually requires some form of seizure control (mutexes, semaphores, monitors) to coordinate the flows between them.

− Interaction of using messaging: in a multiprocessor system on each processor is run single-threaded process that communicates with other processes running on other processors via messages. Processes are created explicitly by calling the appropriate function of the operating system and messaging using the library (for example, the implementation of the protocol MPI), or by means of language (eg, High Performance Fortran, Erlang and occam). Messaging can occur asynchronously or using the method of "rendezvous" in which the sender is blocked until such time as his message is delivered. Asynchronous messaging can be reliable (guaranteed delivery) or unreliable.

Parallel systems based on the exchange of messages is often easier to understand than the shared memory systems, and are generally regarded as a better method for parallel programming. There is a large variety of mathematical theories for the study and analysis of the systems with the transmission of messages, including the model of actors and different types of process calculi. Messaging can be efficiently implemented on symmetric multiprocessors as a shared-memory coherence, and without it.

− The hybrid method: on multiprocessor systems with distributed memory (DM-MIMD), where each node represents a multiprocessor system with shared memory (SM-MIMD), you

can use hybrid programming method. At each node, the system runs a multithreaded process that allocates flows between the processors of the node. Data exchange between the flows at the node via the shared memory and the data exchange between nodes – through the transmission of messages. In this case, the number of processes determined by the number of nodes and the number of streams – the number of processors in each node. The hybrid programming method is more complex (requires a special way to rewrite the parallel program), but the most effective use of hardware resources of each node in a multiprocessor system.

Naturally such a system can also be used exclusively method of transmitting messages, i.e. run on each processor unit of each individual process. In this case, the number of processes (and streams) is equal to the number of processors to all nodes. This method is easier (in a parallel program it is only necessary to increase the number of processes), but is less effective, since the processors of the same node will exchange messages with each other, as if they are on different machines.

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<div align="center">

ARTIFICIAL INTELLIGENCE ISSUES IN GO-LIKE BOARD GAME
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Artificial intelligence dominates humans in the majority of board games. Despite the enormous amount of labour Baduk still remains the latter sought-after board game where computer performance is still weak.

Making a move, the player puts one stone on point of intersection of lines (called crossing points) that is not occupied by another stone. Once placed on the board, stones, do not move, but can be captured by the enemy and taken off the board. Each stone must have at least one freedom point − adjacent vertically or horizontally (but not diagonally) unoccupied point. Neighboring or connected as a continuous chain neighbor stones form a group and share freedom points with each other. When a stone or group of stones is surrounded by opponent stones so that they don't have any points of freedom, they are captured and removed from the board.

Over time it was considered that the programs which coders had created for Baduk have significant differences compared to the same programs which was built for chess, since methods based on the search with much bigger speed compared to the human experience, combined with a relatively low scholarship of the domain will not be that efficacious for Baduk. Consequently, great efforts in the area of computer Baduk were spent to combine expertise with nearby investigation to find answers to tactical character of the entertainment questions. The outcome of these efforts were code, which was written by programmers, that can find good solutions in some local condition, but had obvious ineffectiveness in the full game processing.

The most principal alternatives to the use of coded expertise and exploratory movements is the Monte Carlo method. However, the essence of this specific method is that you first select a point on the current board position, for which you can decide to make a move, which can do the start in series with each of them played a large amount of random

parties. Position that gives the most complete victories to defeats ratio, have been chosen for the next move. The advantages of concrete method are that it does not require the extensive knowing of the problem domain and require a little bit of memory. However, this concrete technique has obvious flaws. Because the movement planare produced randomly and addressed to not every possible extensions, some moves will be mistakenly considered as good. Even despite the fact that a random sample of sequels is favorable; the enemy may have few, but quite obvious moves that allow him to gain an advantage. The result is a coded program, which is good and deep in strategy, but slightly weak in tactics.

Baduk game belongs to deterministic class of games. This means that both players know everything about the position on the board and can observe all the enemie's possible moves. So it is not obvious what aspects of a game should be random and why such an approach obtains good results.

Beginners often learn by viewing the registrations of the old parties, which were completed by professional players. This technique may be a popular hypothesis proves the accumulation of experience is the key to building a strong AI. Next to realization, the experimental information has demonstrated that it is highly effective way. The programmer's role is limited to take all useful heuristic methods, which should be translated and packaged into machine code by using template matching and template distinction techniques to identify when they should be applied. Most comparably prosperous results were obtained on the basis gaming skills of programmer`s and their personal insights of the concrete game party, and not based on formal mathematical mistakes, they try to let the machine to imitate the style in which they play Baduk.

Another approach in the artificial intelligence sphere is to create the gameplay algorithm that uses mini-max search in binary tree. To do this, consider all hypothetically potential consistency of moves to a determined depth, and then use the estimate function to calculate the value of travel, from the place where you have started each sequence. A step that guide to the best result is repeated on the table and then same function is performed for every stroke of the coded machine player. While both methods that are based on using a search tree were giving good results in chess game, they were less successful when applied to Baduk. Component of the reason for that lies in the fact that it is tight to establish an useful estimation function and halfway because of the great amount of feasible moves, which drive to a wide branching ratio. This technology makes the search tree too resource consumable. Therefore, software-intensive search trees can play well only on a small boards 9 by 9, but not on a large 19 by 19.

Knowledge-based programs for the Baduk game are very effective, yet their level of knowledge is close to the level of their programmers and related specialists in the subject area. Machine learning methods help to solve this problem. They allow the program to generate patterns and behavioral strategies are not incorporated into it in advance. Basically, this approach is implemented using neural networks or genetic algorithms to find the right situation in a large database of games, or play a lot of games against itself or people. Popular programs that use neural networks are NeuroGo and WinHonte.

On March 17, 2012 the first two games between the program Zen19, created by Japanese programmer YojiOdzimoyandrTakemi Masaki, owner of 9th Dan, one of the best players in the world, were played. The program was victorious in both two games, that were played with handicap of four and five stones.

The number of possible transitions in the majority of situations is huge. This makes the creation of a strong program for Baduk game much more difficult. For example, in chess programs are widely used endgame database − pre-rendered completions for the party when

few figures are left on the board. The creation of such a database for Baduk is almost impossible. So, now Baduk is a reference problem for developing artificial intelligence algorithms and decision making theory.

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THE RUST PROGRAMMING LANGUAGE
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Today the most widely used programming languages for system programming are C and C++. They allow to make easily a lot of very hard detectable errors. The Rust programming language was created to make programs safer.

Rust is compiled computer language, which collects best solutions from existing languages. It is developed as an alternative to C++. Developers claim that Rust has some advantages, such as concurrency, speed, safety, parallelism.

Firstly, Rust was created and developed by Graydon Hoare, who works in Mozilla. But this project drew the attention of Mozilla's and it was the first project of Research & Development department. Mozilla needed the solution which can help to resolve problems occurred while using C++ and such solution was Rust (it is safer than C++).

The Rust language is focused on two main concepts: ownership and borrowing. These two features allow to write code that guarantees not to have fragments that uses freed memory. And this is achieved without performance penalty.

Rust combines features taken from other languages, such as Haskell/ML, C++. For example, algebraic data types, pattern matching, closures, zero-cost abstractions, concurrency without data races, etc. It is multiparadigm language that allows you to write programs with functional, imperative or object-oriented paradigm. Rust provides the safety to programming, but still offers the efficiency and control of the machine at the low level like in C and C++ languages.

Let's see examples.

Compiling the following C++ code will produce a warning, but running this program will cause a segfault.

```
int main() {
char *s = "hello world";
*s = 'H';
}
```

The Rust compiler does not allow programmer to make such errors. Look at the following code.

```
fn main() {
  let s = &"hello world";
  *s = "H";
}
```

Following code will not compile and Rust will print out an error message. This is an advantage of Rust.

Example 2 of Rust code:

```
fn main() {
let nums = [1, 2];
let nams = ["Sergei", "Dima", "Ivan", "Misha"];
let mut oddNums = nums.iter().map(|&x| x * 2 - 1);
for num in oddNums {
    spawn(proc() {
      println!("Hello from {:s}!", nams[num]);
    });
  }
}
```

Here we can see some Rust features. Variables are defined with "let" keyword in Rust. This code creates vector of integers (named "nums") and a vector of strings (named "nams"). It's unnecessary to explicitly state types of variables, because Rust language supports type inference. By default, variables in Rust are immutable. If you need a mutable variable, you should to use keyword mut. The for loop looks like usual for each loop from Ruby or Python programming languages, but it is as effective as the C++ for loop. Rust allows to create a thread with the spawn() function, that receives a function that you need to execute in this thread, as a parameter.

To sum up, Rust is a modern and regularly updated language which combines best concepts of programming. Rust is used for creating large client and server programs using principles of controlling memory, concurrency, and safety. It allows to make software products safer than C++ with the same efficiency.

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CLOUD COMPUTING

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Nowadays, people everywhere are surrounded with computing devices. Throughout the period of development of computer technology, its power is constantly increasing. According to Moore's Law, the number of transistors and, consequently, the power of computing devices increase exponentially over time. And even though this inexorable growth, there have always been and still are tasks that the current capacity of single computers is not enough to solve.

To solve such computationally-tedious tasks effectively computers are combined in various computer networks or clusters. Huge distributed computing clusters are often referred to as "cloud system" and the calculation performed in them, respectively, "cloud computing". To the great popularity of distributed platforms led the fact that they contain huge computing capabilities and convenience to the user, who receives necessary computing resources. This caused active development of information technology.

Currently, there are many products and technologies that offer certain solutions in parallelizing computations. Among them are the following classes of solutions:

− Close-commercial 'cloud-giants';
− A platform for distributed computing;
− Specialized tools for creating distributed web services.

It is worth mentioning that nowadays the term 'cloud computing' is interpreted by different people in different ways. To sum up, under the term "cloud systems" we mean huge distributed platform. In fact, these platforms do not necessarily have to be measurable – there are, for example, multiple cloud storage. The most popular are huge public "clouds" of such IT-industry giants like Google, Microsoft and Amazon. These products are available to anyone who is willing to pay for them, and have a very high quality, reliability and performance. However, they are closed and do not allow deployment outside the territory controlled by their owners. There is no way to deploy such a 'cloud' on your own equipment.

Less popular, but also well-known are numerous, mostly free (open source and free license) products for the deployment of large distributed networks to massive hardware. These computer networks are often called "private clouds". Another name for these products is a grid toolkit. Decisions of this class can combine multiple computing nodes in a network for future tasks run in it. Most of them aimed at the implementation of batch jobs, composed of different applications run on the nodes and transfer data between them, which make it possible to use such assemblies for a wide range of tasks. An important feature of these solutions is integrated protected space in which the tasks being performed find themselves. Access to data and calculations are strictly limited according to system settings that can help you control users and data stored therein.

A large group of suggestions in the field of cloud computing is the realization of the concept of "Software as a Service" (SaaS). Examples of SaaS are web-application like Zoho (word processing, spreadsheets), Salesforce (system of customer relationship management), SlideRocket (Presentations) or Web-services, such as Google Search, Yahoo, Weather or PayPal. These are all great examples of cloud computing, but they are unlikely to be useful to the company that is going to implement cloud computing. However, they may be complementary to other types of cloud computing.

Type of cloud computing, which is probably most suitable for use in business infrastructure, is known as the "Platform as a Service' (PaaS). Among the most famous examples of PaaS can bring different types of cloud storage, such as storage of unstructured data with service Amazon (Amazon Simple Storage Service, S3) or file storage IBM (IBM Scaleout File Service, SOFS). Both these technologies are distributed file systems. Access to S3 is carried out through Web-service interface, while access to SOFS is available through file protocols such as NFS and FTP. Amazon also provides storage of structured data by using SimpleDB. SimpleDB makes it possible to store and ask structured data using an interface based on Web-services.

According to numerous forecasts made by leading consulting companies in the world, the rapid improvement and spread of cloud technologies (cloud computing) is now one of the key trends that in the next 5-8 years will definitely affect the global development of not only the IT industry but also business, finance, public administration, medicine, education and many other spheres of human life.

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THE SHELLSHOCK BASH VULNERABILITY
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Bash is a shell that is widely used in Linux and Unix operating systems. Bash can also work as a parcer for CGI scripts on the web-server, e.g. Apache. The history of Bash started in 1980s, when it developed from the earlier realizations of shell. There exist other interpreters, of course, but Bash is used on default in Linux and Mac OS X, which are quite widespread. This interpreter is acknowledged as one of the most widespread utilities in Linux-based systems. It is Bash's prevalance that is the main reason for Shellshock to be so dangerous.

The vulnerability was assighned level 10 of 10, which is very bad. The easiness of attack execution because of the low Access Compexity, and the absence of necessity of authentification to use Bash with the help of CGI scripts make the situation even worse.

The main danger lies in the possibility of random definition of environments variable inside the Bash which defines functions. The problems appear at a moment when Bash continues processing commands of the interpreter after definition of the function, which allows to execute an attack with embedding of code.

http-header = test:() { :; }; ping -c1 93.158.134.11

The identification of function is () { :; };, and the command to the interpreter is ping and its parameters. Any command can be executed when the interpreter Bash is processing this line. In the context of web it can be achieved through such mechanism as CGI script and not necessarily through request header.

The situation can be mitigated by cutout of CGI functioning. However in most cases it will seriously affect the website and will at least require active testing to make sure that it is operable. If Telnet, SSH and DHCP are taken into consideration, the scale of the problem escalate manyfold despite the fact that it is a matter of web server attacks. The danger exists only after SSH authentification, however later other vectors of attacks will be found.

But what are the possible consequences? The acquisition of the access to the interpreter has always been a huge success for the hacker as it is equal to the gaining of the control over the server with relevant privileges. The access to the internal data, the reconfiguration of the environment, the distribution of the malicious malware etc. The opportunities are almost unlimited. There are lots of precedents of exploits which can be applied against a large number of computers.

Sadly, when it comes to the execution of a random code in the command interpreters of half of the web servers of the internet, the possibilities are quite high. One of the worst one is the gaining of the access to the internal files. The files with passwords and configurations are the target of greatest interest, but it will be possible to get access to the entire files. The same applies to the possibility of recording files to the remote machine. It is one of the easiest ways to replace web pages on someone's else's website not to mention the distibution of malicious malware.

To prevent the security hole of your system you should, first of all, find out whether you are at risk. The following command should be performed in the interpreter:

env VAR="() { :;} ; echo You're exposed" bash -c "echo Done"

If "You're exposed" appears, then the vulnerability exists.

Obviously, it is critical to cover the break. The patch will significantly lower the risk of performance of the extrinsic code at the end of the function, defined in the Bash. For a number of distribution disks of Linux there already appeared instructions, e.g. Red Hat.

The Intrusion Detection System (IDS) update instructions already appeared and they should be added to one's armory by various organisations, esp. by the companies, which need to conduct out continuous tests before the installation of patches. Provider Qualsy offered its own way of detection of an attack and many other providers probably worked on this problem.

The mire cardinal methods include the substitution of Bash for some other interpreter, or blocking of the system subjected to risk. Both methods may have far-reaching effects and shouldn't be applied carelessly. However this may become the main feature of Shellshock, and that is fast adoption of hard decisions which can have serious impact on the real business, for the sake of avoidance of potentially far more significant damage.

It is hard to find out whether Shellshock was exploited before because the attack vectors were not recorded. Besides this will not happen if the attack will be carried out through HTTP or POST-request. The most frequent answer to the question «Will we be attacked through Shellshock?» will be: we have no proofs that we have covered this vulnerability. It leaves the owners of the websites and other systems in an unpleasant obscurity regarding them being compromised.

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AUDIO SAMPLE RESTORATION
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Damaged wax cylinder, audio recording from which was restored using modern technologies.

There is a considerable number of archaic sound record devices in existence, as well as recordings created using such devices. "Archaic" means that the recording devices captured sound on a wax cylinders or discs. Equipment like that was relatively common in the late XIX – early XX centuries.
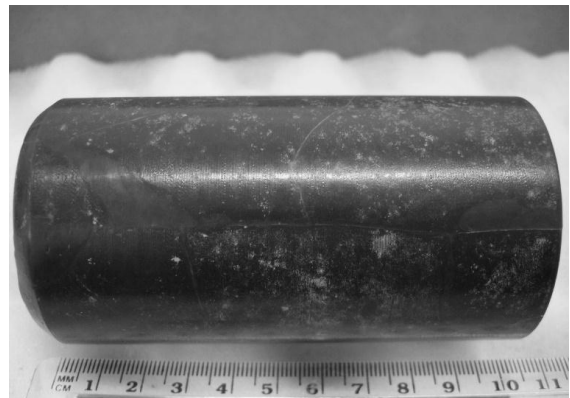
The issue is that the recordings created in such a way are fragile, and over the years wax cylinders turned into unreadable relics. Such a cylinder will simply crumble, before attempting to recreate the sound in a traditional device. But, the oldest audio recordings being very valuable, this problem has been solved. The solution has been found in the usage of an optical scanner.

The surface of a cylinder is scanned, and then the acquired data is processed in the specialized software. After that, the virtual sound player comes into work, which is based on algorithms converting images into sound.

This exact method helped to recreate the voice of Graham Bell from the recording made back in 1885. Sometime later, the recording captured on a tin foil in the Edisson's lab in 1878 was recreated as well. The earliest recording, which was recreated successfully, was

a sound captured in 1860 by a French Édouard-Léon Scott de Martinville. The inventor captured sound on a smoked paper instead of wax, which further complicated the task of restoring the sound, but did not make it impossible to complete.

How the sound is restored?

The most sophisticated technology to restore sound from various types of surfaces was developed by specialists of Southampton University.

In the beginning, the specialists were testing three types of sound restoring technologies: polychromatic, laser triangulation, confocal laser.

After much debate the scientists came to conclusion, that the first method is the best for complete sound restoration, because not only the depth of a track is considered but also it's shape.

The resulting device is displayed below.
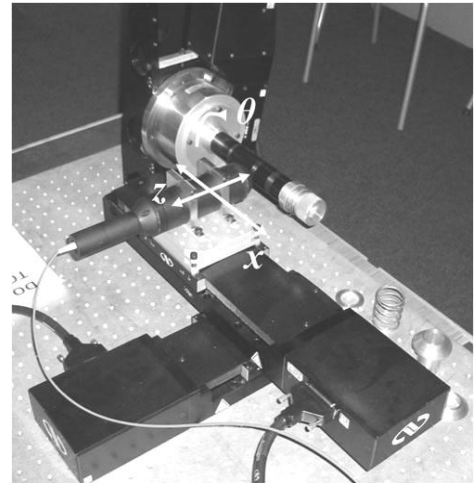
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WIMAX (WORLDWIDE INTEROPERABILITY FOR MICROWAVE ACCESS)

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WiMAX – The telecommunications technology, developed with the aim of providing a universal wireless connectivity at greater distances for a wide variety of devices (from desktops and laptops to mobile phones). Comparison of WiMAX and Wi-Fi is not uncommon − terms consonant, the name of standards, which are based on these technologies, like (standards developed IEEE, both begin with "802"), and both technologies use a wireless connection and are used to connect to the Internet (traffic channel data). However, despite this, these technologies are aimed at solving completely different problems.

WiMAX system is long-range covering kilometers space, which typically uses a licensed frequency spectra to provide an Internet connection point-to- point provider to the end user and Wi-Fi system is a short-acting, usually covering tens of meters, which uses the unlicensed frequency bands for access to the network. In general terms, WiMAX networks consist of the following main parts: the base and subscriber stations, as well as the equipment that connects the base stations together with the service provider and the Internet. To connect the base station to the subscriber uses high-frequency radio waves range from 1.5 to 11 GHz. Under ideal conditions, the communication speed can reach 70 Mbit / s without the need to ensure line of sight between the base station and the receiver.

WiMAX is used for solving the problem of the "last mile", and for providing access to a network of office and district networks. The structure of the networks IEEE 802.16 family of standards similar to the traditional GSM networks (base stations operate at distances of up to tens of kilometers , to set them to build a tower does not necessarily – be placed on the roofs of houses subject to the conditions of the line of sight between stations).

WiMAX Forum has developed an architecture that defines many aspects of WiMAX networks: interaction with other networks, allocation of network addresses, authentication, and more.

- SS/MS: (the Subscriber Station/Mobile Station)
- ASN: (the Access Service Network)
- BS: (Base station),
- ASN-GW: (the ASN Gateway),
- CSN: (the Connectivity Service Network)
- HA: (Home Agent,)
- NAP: (a Network Access Provider)
- NSP: (a Network Service Provider)

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UNDERSTANDING OF COMPUTER SYSTEM ARCHITECTURE THROUGH DRIVER DEVELOPMENT

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For most students learning architecture of computer system is not only tough thing to understand, but it something hard to remember. So it would be better if we would have any other way to take control of this not interesting at first sight stuff.
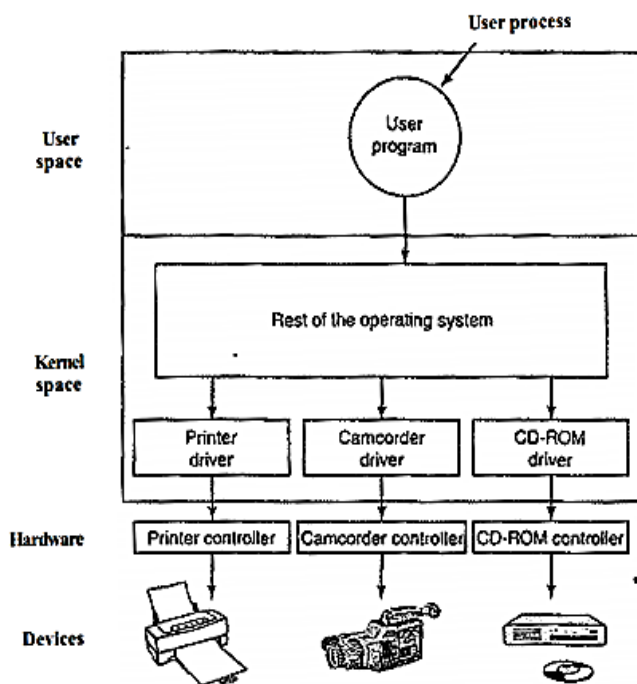
Figure 1

The best way to start is to write driver for POSIX-oriented operating system like Linux. First, you should know that we can connect a lot of devices and controllers, which have some number of device registers, to our personal computer for interaction with it and work properly. In result, each input/output device attached to a PC needs specific code to manipulate it properly. Code like that is called the device driver and is generally written by the people who had manufactured the device and had delivered it within. The main role in such system play input/output drivers for mouse or keyboard interaction and character devices drivers for interaction for example with printer or printing system.[1]

Linux is one of that freeware operating systems that have their internals open for all to see. In comparing with Windows, Linux has its own kernel, which remains large and complex body of code. In Linux kernel device drivers take on a special role: they hide completely the details of hoe the device works, so they are distinct "black boxes" that make a particular piece of hardware respond to a well-defined internal programming interface.

Device drivers take on a special role in the Linux kernel. This kind of software looks like "black box" that make some specific hardware respond to internal interface, but drivers also hide the details of the controller work. In Linux drivers named as modules (watch Fig. 1).[2]

In order to develop Linux device drivers, it is necessary to have a comprehension of C programming language basics (some in-depth knowledge of C) and know how microcomputers work internally: memory-addressing interrupts, etc. First, you need to know, how driver works in the system on kernel level. In Linux system kernel source-code-tree consists of built-in pieces of code for interaction, like kernel itself and modules, which are third-side developed pieces of code, which can be imported to kernel code or speaking in kernel terms to be "inserted". So in Linux drivers called modules.

If you need to use your own driver for interaction through some already existed port or built-in device, then you need to recompile the kernel and make appropriate driver modular. For that you must do some steps:

1. Find information about the version of your kernel
2. Install main packages for development
3. Rebuild the Linux kernel

Depending on the performance of your CPU, quantity of CPU's and quantity of components you had chosen in configuration file your kernel will be compiling during 3 and more hours, so it is better to read some useful book or write a bit of code through all the process.

Now about modules itself. Simple module must include kernel module files, implement two important functions for initializing, and for unloading the driver from system. What is smart is that we can debug the driver without any additional debugger tool or integrated development environment. All what you need is just kernel messaging with different priorities. All you need for development is only your linux terminal.

As you can see, driver development is one of the best way to start learning computer architectire. It has got many advantages. At first you colide with many principles of building/rebuilding modules, develop and compiling drivers by yourself, so it will be easy to deal with many problems in future. Next you will get a good experience in this branch of programming and you can specify it in your resume. Person, who know how system works from inside get more points for employer. At last, it is a great to improve your skills in such way.

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DART – STRUCTURED WEB PROGRAMMING LANGUAGE
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JavaScript is the most popular programming language that is used to make interactive web pages and different web apps. It suffers from «fundamental» flaws, which can't be corrected by means of evolutionary development. That's why Google decided to create its own programming language, which will be positioned as a replacement for JavaScript.

Dart is a modern language, which is dependent on classes and serves to create structured web apps. It is appointed to be simple, efficient and scalable. Dart contains influential features with well-known language constructions.

Some problems can be solved using Dart:

− Small scripts usually mutate into huge apps. Without any structure it is difficult to debug and maintain. Furthermore, these solid applications can't be divided into appropriate parts, so various developers can't work on them separately. Web applications can't be efficiently developed, when they become too large.

− Developers are divided into 2 groups: supporters of the static and dynamic languages. Traditional static languages require heavy tools and complex coding styles that a developer can limit.

− Developers can't produce homogeneous systems that encompass both client and server, except for a few classes for Node.js and Google Web Toolkit (GWT).

− Dart is used in Web sites and apps, which is less complex and easier to develop.

Main task of Dart is to solve the shortcomings of JavaScript, or to be more precise, it should become an advanced replacement. This new programming language is going to have a lot of strengths.

First of all, convenience of development will be higher than in JS. Dart should not complicate, and vice versa, it makes the threshold easier (due to a clearer and more concise syntax), and well-established entity of JavaScript: interpretability, ease of development.

Secondly, the increasing of productivity: speed is one of the main problems of modern technologies. Since the advent of HTML5 and the phasing out of Flash technology, the capacity of client code is growing up rapidly. As a result, the user doesn't want to use significant resources to interpret materials. Virtual machines EcmaScript (JavaScript) have a number of "narrow" places that have a negative impact on the overall performance of the application, so the Dart should provide a better option.

In addition, the increasing safety of code is the endless process and Dart must make innovations in this area, and the capacity of defence should not adversely affect both the ease of design and performance.

Finally, new programming language will be friendly to the code editor and developers of additional tools. Modern web-applications impose new requirements in terms of support, debugging and code modification. Accordingly, Dart should be designed to meet these requirements. It must interact perfectly with additional tools that can facilitate a difficult process of development, and also be prepared that advanced IDE will require support of normal things such as: the search function call, refactoring, etc.

There are various ways to treat Dart, but clearly one – it will definitely bring a certain portion of innovations. Even if it could not fully replace JavaScript, knowledge gained in the course of its development, probably will be able to move into the world of JS. And perhaps this knowledge will spill over into another completely new programming language.

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ACTIVITY RECOGNITION IN MEDICINE
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According to unofficial statistics only twenty percents of people take medicine according to doctor's prescription correctly. Sometimes a person can forget to take medication or take it later than needed. This often causes highly negative effects. Many drugs should be taken according to meals. There are some devices that help to receive medication according to time schedule. They are useful but not enough to ensure that user follows doctor's prescription correctly.

Technology evolution gives us new opportunities to solve the problem mentioned above. Researches show that human activity recognition can be successfully performed using acceleration data acquired from wearable device. Also most recent researches in activity recognition field show that it is possible to recognize human activities like "sitting", "standing", "eating", "sleeping" etc. This also can be done using a single three axis accelerometer and low computing resources. Let's examine how these techniques can be used in medicine application field.

Doctors prescribe many drugs for elderly patients. Some medications should be taken at given time but most drugs must be taken before a meal, during the meal, after a meal, at bedtime or in the morning after sleep. There are only some types of medication dispensers with built in alarm on market and none of them incorporate activity recognition opportunities. Such devices may be useful for elderly people, patients with impaired memory, busy people who forget to take medication. An intellectual portable device can be developed to help people to receive drugs in time according to time schedule and activities such as "taking meal" or "wake up in the morning". By detecting these activities and with support of time schedule such device can increase drugs effect by precise scheduling. For example, a person can receive drugs in the morning before having meal, if it is prescribed by a doctor, or have medicine after meal, or before a sleep. Also it can help to get full course of antibiotics to preserve their effectiveness.

Let us now describe a possible basic structure of such a device. It should contain a microcontroller to be able to collect accelerometer data, an accelerometer, an LCD to display information, a keyboard, and a battery to power all the components. Power consumption is a very important factor for such devices. So it is important to use power efficient components in the design. Users will often forget to charge the device especially after long usage. Also this device may be equipped with a pill container to make medicine available at any time. This container may be embedded in a wearable part to be available out of home. And it can be separated and hold a large number of different medication in big quantities.

The device should be able to signalize about necessity of drugs reception in different ways, for example, sound signal, vibration signal or light signal. Also it should be able to control that user have accepted the signal and received prescribed medicine in time. Also it should provide a distinguishable signal in case when there is no needed medicine.

Price factor is also important. Medical and health-care products must be cheap enough in order to have big popularity among customers. Modern components are cheap enough and provide sufficient computational resources as shown in [4]. This device should be easily configurable through interactive PC software interface to allow doctors or users themselves to change schedule for every pillow or medicine. Also a comfortable interface on the wearable part is needed to allow doing modification of the schedule without PC.

To sum up, the described system is indeed very useful and can be developed. This will be the subject of further research.

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PRACTICABILITY OF CREATING NATIONAL GEOGRAPHIC INFORMATION PLATFORM

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Geographic information system (GIS) is information system which provides collection, storing, processing, displaying and distributing of data, as well as obtaining new data and knowledge about the spatial or geographical entities [1]. It is a perspective information technology allowing you to perform a wide range of operations with spatial data, involving accumulating, processing and analyzing, which cannot be done by the means of conventional relational databases.

GISs are widely used in science, government, business and industry. Their application includes real estate, natural resources, climatology, public health and many others. GIS is also important technology to the military sphere [2].

The existing implementations of GISs differ by their capabilities, data structures, file formats, etc. Modern GIS isn't just a single program, but environment consisting of many modules runs on a single machine or it can be distributed over a network.

These modules usually share the same data transfer protocols, file formats and have a similar interface. It is more like infrastructure for creating own system rather than application program. Accuracy, operability, fault tolerance and security are crucial for such systems, especially when it comes to government and military usage. Common file formats compatibility is important to maintain existing projects and it allows the migration from different GIS implementation.

Popular commercial GIS implementations can provide sufficient operability and compatibility. GISs mostly used in Ukraine today were developed in the USA, Canada and other countries [3]. If the price isn't considered they are fine for educational, scientific or commercial use.

But governmental and military uses require high level security. Such commercial systems mostly use unknown algorithms and even third-party machines to process data. They may distribute information (which may be confidential) via network without confirmation. Backdoors are quite common too. Such software cannot be considered secure. That is why it is crucial for government to have own GIS platform implementation, which will provide sufficient security, fault tolerance and operability.

The basic requirements for national GIS platform are:
- − High security and fault tolerance.
- − Modularity.
- − High operability and performance.
- − Network communication.
- − Extendibility and scalability.
- − Common protocols and file formats compatibility.
- − Availability of own secure file formats and protocols.

Such platform will enable us to create high-quality safe GIS solutions for governmental, military, scientific and commercial uses. Using safe information technologies means safe and accurate management in all affairs. Ukraine has both demand of this platform and institutions for developing such complex software. Creating the national GIS infrastructure is an important step in the governance automation.

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RECURRENT NEURAL NETWORK
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Recurrent network − type neural networks that have feedback. Feedback is a logical connection over dial-up element with less distant. This allows the neural network to memorize and reproduce the whole sequence of responses to a single stimulus. From the point of view of programming in such networks appears similar cyclic execution, but from the point of view of systems − this network is equivalent to a finite state machine. These features of recurrent neural networks potentially provide many opportunities for modeling biological neural networks. But, unfortunately, most of the features currently poorly understood in connection with the possibility of all kinds of architecture and the complexity of their analysis.

The first ideas about neural network with feedback described by F. Rosenblatt in the conclusion of his book on perceptrons in 1962. F. Rosenblatt gave a qualitative description of several types of perceptrons with feedback. The first group of such perceptrons was intended for the development of selective attention, and the second group to study the sequence of reactions. In 1969 after the release of the book of Marvin Minsk criticizing opportunities elementary perceptron works for the study of artificial neural networks has almost stopped. Only a small group continued research in this direction. In 1978, one such group began its work at the Massachusetts Institute of Technology. Since the neural network Jordan, the report which he published in 1986, a new stage in the development of neural networks with feedback. Then in 1990 Elman proposes to modify the network in Jordan. The result is the now known Neural network Elman. Since that time, such networks are called recurrent. Usually they are based on multilayer perceptron, which is becoming very popular. Such networks on its budovou and diversity is much easier their predecessors, but they are suitable for solving the task of memorizing sequences without problems with stability.

This is achieved by the fact that the signal from the output layer with only a single delay comes on additional inputs, and is not supplied to the primary inputs because there is

no mixing of signals and there is no question about sustainability. The network of Elman differ only by the fact that the signal from the inner layer comes to additional inputs. These additional inputs are called context, which are used to store information about pre-stimulus reaction, allowing the reaction network now depends not only on the current stimulus-response, but also the previous one.

When working, neural network takes on the values of input variables and returns the values of output variables. Thus, the network can be applied in a situation where you have a certain known information, and you want to get some yet unknown information.

Tasks which can be solved by a neural network is determined by how the network works and how it learns. Recurrent networks are dynamic, because the feedback they modified the inputs of the neurons, thus, changes the state of the network. The behavior of recurrent networks is described by differential equations, usually the first order. This greatly expands the applications of neural networks and methods of their study. The network is organized so that each neuron receives input from other neurons, perhaps from himself, and from the environment.

The best known algorithm for neural network training algorithm of back-propagation errors. It's the easiest to understand, and in some cases it has certain advantages. The algorithm calculates the gradient vector of the surface errors. The vector indicates the direction of the shortest descent on the surface from this point, so if we "little" will move with it, the error will decrease. The sequence of these steps will result in a minimum of one or another type. When the length of the step, the convergence will be faster, but it is possible to jump through the solution or go in the wrong direction. On the contrary, at small step will likely be selected in the right direction, but it needs a lot of iterations. In practice, the step size is taken to be proportional to some constant called the learning rate. The correct choice of the speed of learning depends on the specific task and is usually done empirically. This constant can also be time dependent, decreasing during the execution of the algorithm.

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ARTIFICIAL NEURAL NETWORKS AS THE PATH TO THE FUTURE
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It's about the thing that is both beautiful, mysterious and complex. About the thing that can give large power, but will require thorough preparation and knowledge. So, we'll discuss the artificial neural networks.

What is a neural network at all? This is the neural network of the human brain – the neurons, axons, dendrites. Combined together, they create a neural network, which is the interface of human interaction with the outside world.

Artificial neural network is a mathematical model for the construction of the system, functioning like a human nervous system. It is a system of pseudo-cell networks, designed to solve complex mathematical problems in terms of the shortest time and the most rational distribution of available resources.

The main feature of each neural network – the opportunity to learn and improve their algorithms and modes of interaction with the outside world on the basis of data obtained from this previous interaction. This feature allows you to design a truly dependable and

survivable systems designed to manage the most important tools and equipment, which cannot be handled by modern computers.

Also, a neural network designed to solve complex mathematical problems that require a large number of diverse approaches and use copious amounts of resources. These systems, based on their same experiences, identify different approaches of solving problems of this kind.

Neural Network – a truly new approach to the development of computers, for systems of this type are similar to the human brain, which is known as the most advanced machine for solving the problems and difficulties of any kind. Difficult tasks of any science are no longer such. Complete triumph of human genius.

It opens us a door to the new, higher level of technological evolution. It gives us a chance to achieve the knowledge, which was closed for us until now. Humanity will be able to make step into new universe, full of undisclosed potential of the whole university.

Of course, in comparison with the human brain neural network it looks quite modest, but who knows what will happen tomorrow?

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DISTRIBUTED APPLICATIONS PROGRAMMING WITH ZEROC ICE
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The *Internet Communications Engine*, or *Ice*, is a new object-oriented middleware platform that makes possible for developers to create distributed client–server applications with minimal effort. *Ice* platform also provides object-oriented remote procedure call (*RPC*), grid computing and publish/subscribe factory functionality developed by *ZeroC* corporation and licensed under the GNU GPL License and a proprietary license for commercial use.

The design philosophy of *ZeroC Ice* makes this middleware platform easy to use and to be productive in the shortest possible way.
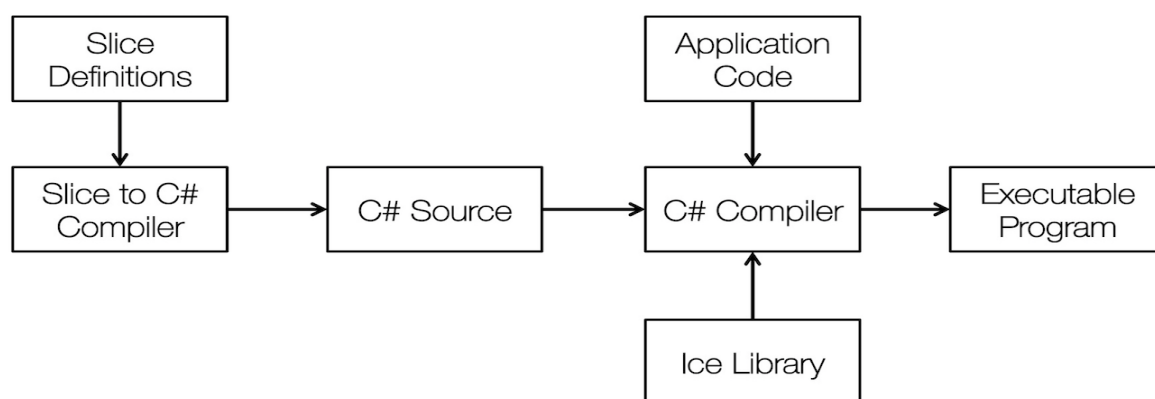
Figure 1. Ice Programming Model Overview.

When the application evolves and more complex approaches are needed, the *ZeroC Ice* platform can be incrementally improved as the need for it arises. If some part of the platform (for example: such module as *IceGrid* etc.) is not needed in particular application, it stays out of the developers' state of mind and do not impact negatively on productivity.

Ice middleware technology is simple to understand and easy to start with. But, despite its simplicity, it is flexible enough to process and compute even the most demanding and high-loaded applications.

Programming Languages

ZeroC Ice currently supports the possibility to write distributed applications in C++, Objective-C, C# (.NET group), Java, Python, Ruby and PHP on most major operating systems: Linux, Unix, *nix, Mac OS X and Windows.

With the help of *Ice Touch*, your application can be executed on the iOS devices, while Ice for Java can be used to for Android applications. This makes *Ice* platform very universal and gives to developer almost endless possibilities to create all kind of applications.

For this moment, the *Ice* C++ mapping is pretty intuitive and understandable, it requires less code for equivalent functionality, integrates with the STL-library, and is thread-safe and exception-safe.

Advanced Technology

Ice platform is much more than just a *RPC* (remote procedure call) technology. It supports synchronous and asynchronous calls/callbacks and deals with firewalls and brandmauers thanks to support for bidirectional connections. *ZeroC Ice* middleware in addition allows operations to be batched for efficiency (chained operations), and permits control of threads and resource allocation and deallocation.

Ice technology allows developer to create systems that are fault tolerant, not only makes applications to escape failures, but also increases performance because *Ice* allows programmer to manage load balancing.

Services

Despite high-performance RPC, good load balancing, thread safety and efficiency, *Ice* middleware also provides a number of services. These services provide functionality that is required by the majority of modern distributed applications, such as, for example: event distribution.

It is possible to use all *Ice* services for huge numbers of clients and servers. By using *Ice* middleware services, developer can reduce his efforts and safe a lot of time.

Conclusion

Ice middleware provides a communication way that is simple to understand and easy to work with. Despite its simplicity, *Ice* is flexible enough to process and compute even the most demanding and high-loaded applications.

Ice allows you to write distributed applications in C++, Objective-C, C#, Java, Python, Ruby and PHP on most major operating systems: Linux, Unix, *nix, Mac OS X and Windows. With the help of *Ice Touch*, your application can be executed on the majority of all modern mobile devices.

Ice can be used to integrate distributed applications within the web. *Ice* for Java allows you to run a client application in a form of an applet inside a browser window, and *Ice* for PHP makes it easy to fill web content with data from back-end servers.

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PROBLEMATIC OF USING SYSTEM AND SERVICE MANAGER OF LINUX
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Nowadays in open-source community and developer associations there is a discussion about using systemd as a new system of initialization and service management in Unix-like system. Lennart Poettering an employee of Red Hat and the author of this system was motivated to create this service because any of existing initialization services as SysVinit, UpStart does not correspond to the realities of our time – appearance of SSD-drives, having almost zero time finding the necessary data at high speed and, therefore, possibility of parallel downloading information. Another problem of SysVinit is its dependence on a number of fairly heavy and not very fast applications – bash, awk, sed, and others, which do not differ emergency work on embedded systems. Considering that Linux has been used on servers where the increase of resiliency is required, SysVinit should provide opportunity of tracking and restarting services in the case of their failure, which it did not provide.

As you may know the systemd's developers planed to change initialization system of Linux adopted from Berkeley Software Distribution (BSD) and UNIX System V OS[3]. There is no doubt that systemd is a daemon, just like init, that ruled other types of daemons. In fact, all daemons, even systemd, are background processes. The first daemon that starts the system (while system boots) and the last daemon to finish (shutdown), is systemd.

(Available Native Service Settings) table 1.

	sysvinit	Upstart	systemd		sysvinit	Upstart	Systemd
OOM Adjustment	no	yes[1]	Yes	Timer Slack	No	No	Yes
Working Directory	no	Yes	Yes	Capabilities Control	No	No	Yes
Root Directory (chroot())	no	Yes	Yes	Secure Bits Control	No	No	Yes
Environment Variables	no	Yes	Yes	Control Group Control	No	No	Yes
Environment Variables from external file	no	No	Yes	High-level file system namespace control: making directories inacessible	No	No	Yes
Resource Limits	no	Yes	Yes	High-level file system namespace control: making directories read-only	No	No	Yes
Umask	no	Yes	Yes	High-level file system namespace control: private /tmp	No	No	Yes
User/Group/Supplementary Groups	no	No	Yes	High-level file system namespace control: mount inheritance	No	No	Yes
IO Scheduling Class/Priority	no	No	Yes	Input on Console	Yes	Yes	Yes
CPU Scheduling Nice Value	no	Yes	Yes	Output on Syslog	No	No	Yes

So, as we can see from table 1 systemd has more settings than Upstart or sysVinit. Consequently, using of systemd is more usable for developers and gives more tools for work. Systemd flies in the face of the Unix philosophy: "do one thing and do it well,"[2] representing a complex bundle of hundred of strongly linked binaries. Systemd has more responsibilities than an init system, as it goes on to handle device management, disk

encryption, network configuration, power management, cron, the Linux console, mount points, socket API/inetd, syslog, network configuration, login/session management, mDNS/DNS-SD, GPT partition discovery, container registration, hostname/locale/time management, and other things all wrapped into one. The nature of system is viral[2], in order to its auxiliaries exposing APIs, while being bound to systemd's init. It's represented as dependency to lots of packages and scope in functionality means that distro maintainers will have to make necessary a conversion, or suffer a deviation. As you may know, the GNOME environment constantly makes use of systemd composite unit, like support for logind and non-systemd systems is becoming harder and harder. Under Wayland, GNOME depends on logind, which in turn needs and obviously is a part of systemd. The main part of maintainers has to require systemd because of this, and instances such like. The rapid growth in adoption by distros such as Fedora, Ubuntu, Debian, Arch Linux, openSUSE and others shows that many are jumping onto the bandwagon, with or without justification[2].

In a summary, I would like to add that systemd is, in the way of becoming a comprehensive, integrated and modular platform[1] giving all what you need to bootstrap and maintain an operating system's userspace. All main early boot init scripts are C rewrites and are downloaded with other distributions. Systemd for the embedded case provides the whole functional what you need, in spite of this, you can pick the modules what you want. SysVinit and Upstart are singular programs, which can be useful just with an additional components with variety interfaces. The task of systemd's project is to provide a platform instead of just a program components[1]; this idea allows closer integration, and cleaner APIs. At an early date this will trickle up to the applications. As you can see, there are accepted XDG specifications (e.g. XDG basedir spec, more specifically XDG_RUNTIME_DIR) that are not supported on the other init systems.

Systemd is also a great chance for Linux standardization. Before system, many interfaces have been others on different distributions on every implementation, but since it standardizes it helps to work against the balkanization of the Linux interfaces[1]. This improves the lives of programmers, users and administrators alike

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THE SEMANTIC WEB
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The Semantic Web is a new concept of the World Wide Web and the Internet, which was created and implemented World Wide Web Consortium. This is a superstructure over the existing World Wide Web, which should make the information placed on the network more understandable to computers.

If the Semantic Web will be introduced information searching will be much easier then nowadays. The Semantic Web has undeniable advantages.

In a typical Web, based on HTML-pages, the information contained in the text pages and retrieved by users via the browser. The Semantic Web requires a record of information

in the form of a semantic network using ontologies. Thus, the client program can be directly extracted from the web facts and make logical conclusions.

The Semantic Web is working on the basis of the World Wide Web using HTTP. It has two important features that make possible the perception of information by computer: the use of uniform resource identifier (URI) and the use of semantic networks and ontologies.

URL – a sequence of symbols that identifies a resource.In the World Wide Web it is used to reference the object addressed.In the semantic webURLis also used for naming objects. Not only pages but also real-world objects and even abstract conceptshave their URL here. The uniqueness of the URL for each object allowsto call the object by the same name in different places of the Semantic Web. Thus the description of the object is gradually complemented by information relating to him.

The next important feature of the Semantic Web is the use of semantic networks and ontologies. In the World Wide Web, the information is usually is presented in text form. This form is adapted for the human perception. But computer can't understand the meaning of a block of text, so some worlds in the search results can be not in the correct context. In the semantic web data is described using RDF standard. RDF describes graphs, nodes and arcs of which have the URL. RDF documents should be processed by the computer automatically. They are not suitable for human's reading. The information which is encoded using RDF, can be further interpreted by ontologies and get logical conclusions from them.

Nowdays the Semantic Web is not common. Some experts think that it is not realizable project, at least in our time. But there are some projects that are based on the principle of the Semantic Web. One of the first projects is Dublin Core from Dublin Core Metadata Initiative (DCMI). It is a project whose purpose is to design the standards of metadata, that should not depend on the platform. A project FOAF (Friend of a Friend) also is based on the Semantic Web. This is a project that is specialized in creation of social networks and machine-readable pages. DBpedia is a project the purpose of which is to extract structured content from the information created as part of the Wikipedia.

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THE TASKS PERFORMED ON QUANTUM COMPUTATION
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Known two examples of non-trivial problems in which quantum calculations give radical gain. The first of these − the task decomposition integers of primes, and as a consequence, the discrete logarithm calculation (DL). Then we speak of the DL. Suppose we have a field of residues modulo a prime number. It has primitive roots − such deductions whose degree generate all the nonzero elements. If you specify a root and a given degree, then raised to the power can be quickly (for example, first squaring and then gets a quarter of a degree, and so on. D.) The discrete logarithm − is the inverse problem. Given primitive root and the root of some element of the field, find in what degree you need to build this root to get the item. Here this problem is considered complex. Therefore, complex that a number of modern cryptographic systems based on the assumption that calculated for a

reasonable time is impossible; it is possible, if the module −a sufficiently large prime number. So, for the discrete logarithm is the effective quantum algorithm. Landau construct a quantum algorithm for this and some of the more common tasks. The ideas were different. Shore used about such an idea, it is essentially a quantum looking basis in phase space. It consists of classical states. However, in linear space many bases. We can find a statement that effectively builds a different basis; we can go to him, to make there some calculations go back and get something completely different from what we would have in the classical basis. One of the possibilities to use quantum is that we build a strange basis; it is something we do, return and interpret the results. Shore precisely this idea and implemented. In addition, the transformation is proved that in physics and mathematics is crucial - the discrete Fourier transform. The control qubit is translated in a mixed state, continue to build an operator which, depending on whether zero or one in the control qubit, apply the multiplication to our main registers, or do not apply. Then again returns qubit in a mixed state. It turns out that this is an effective way to make a measurement. That is Chinas noticed that one of the things that we can effectively do on a quantum computer − is to imitate the process of quantum measurement. In this problem, the results of these measurements are effectively retrieved answer. The very process of computing, there is this: we always multiply the same cell on certain constants, measurements, record and then produce a kind of processing of the results of the experiment − a purely classical calculations. All the quantum part is that somewhere near our register is in some mixed state qubit correlated with it, and we are seeing it periodically. To calculate the number of DL recorded by N bits, you need to spend 3 N time units. It is quite feasible − a quantum computer, naturally. But here we must note that no one has yet proved that there is an equally fast algorithm for computing the DL on a normal car. The second task is proposed L. Grover. Consider a database containing 2N records. In the worst case we will have to iterate through all the records 2N −obviously. It turns out that a quantum computer is sufficient number of inquiries about the root of the number of records − 2N / 2. Interesting challenge − the creation of optimal circuits. Suppose there is a function that you want to implement the chip, and this function is set to a program that uses polynomially bounded memory. Therefore, the appearance of devices effectively solve PSPACE-task would uniformly optimal design whose performance computing devices of conventional type. In addition, the PSPACE gets most of the tasks of "artificial intelligence": machine learning, pattern recognition, etc. Therefore, it is well established that quantum computing are somewhere between normal probability calculations and PSPACE. If it turns out that with the help of quantum computing can effectively solve these or other PSPACE-task, the physical realization of quantum computers will open up entirely new possibilities. There is another area of application of quantum computers, which is certainly possible radical gains in existing technologies. This simulation of quantum systems themselves.

WEB PAGES CLASSIFICATION BASED ON THEIR STRUCTURE
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The World Wide Web system is large repository of a various data and the amount of information sources available on the Web has exponential growth. Therefore the process of finding desired data has been complicated. There is a necessary of creating intelligent systems for effectively data extraction.

Data extraction in the Web can be defined as a finding and research of necessarily information from the World Wide Web by mining useful patterns and data from activity associated to the Web. Web Data extraction consists of three groups: clustering (researching inartificial groupings of users, pages etc.), associations (identifying which URLs might be requested together), and classification (process of documents characterization).

Classification is the process of assigning some particular document to one or more predefining classes. In particular, web page classification is the process of assigning a Web page to some few predetermined category labels.

Automatic web page classification problems can be parted into three kinds:

− Manual classification. This approach involved the analysis the contents of the Web page by a group of specialists and the classification was based on textual content as is done to some extent. However, such classification would be subjective and hence open to question.

− Rule-based approach. This approach consists is to write the rules by which the text can be attributed to a particular category. For example, one such rule might look like this: "if the text contains numbers and equations, then classify it as a mathematician." This approach is better than the previous, as the classification process is automated, and hence the number of documents processed practically unlimited. Moreover, the construction of the rules manually can give better accuracy of classification than in the machine learning. However, the creation and maintenance of the rules up to date requires sustained efforts specialist.

− Machine Learning approach. Machine learning focuses on prediction, based on known properties learned from the training data. In this approach, the criterion for the decision of the text classifier is calculated automatically from the training data. The training data is a number of good samples of each class of documents. Machine learning have manual marking (marking the term refers to the process of attributing class document). But the markup is a simpler task than writing rules. In addition, marking can be performed in the normal mode of the system. Thus, the classification of texts based on machine learning, is an example of supervised learning, where the role of the teacher, a person who has given a set of classes and marks the training set.

The major task of Web page classification can be parted into more specific issues: subject classification, functional classification, sentiment classification, genre classification, search engine spam classification etc. This paper concentrated on subject classification and functional classification.

The objective of this paper is to review an automatic classification system for web pages. The decision system designed has three main stages: the data processing phase, the data mining phase and the evaluation phase.

The data processing selects from the raw data base a data set that focuses on a subset of attributes or variables on which information discovery is to be effected. It also removes outliers and some redundant data, and uses HTML code to present the obtained data through an Object Attribute Table (OAT).

The data mining phase transforms the OAT data into usable template in decision trees are created. The evaluation phase proves the consistency of template by means of a testing suite. The positively evaluated decision system can then be used in real world situations that will allow for its validation.

The data set is formed by a list of web pages. In the data processing phase an automatic program processes the HTML code of the various web pages has been used. Particularly, the program collects data and generates the Object Attribute Table. The attributes of the OAT, the columns defines by an expert. Each row of the OAT describes the

characteristics of a web page using the defined attributes. On this step, a specialist assigns classes to each of the rows depending on the defined categories.

To construct predictive model, that is afterwards used to assign marks to web pages, a training set have to be applied. The records appropriate to web pages are used to generate the original model. The evaluation is fulfilling by means of cross validation.

As existing classification methods, decision trees were selected for their simplicity and intuitiveness. The J48 Graft Tree (J48GT) algorithm has been chosen due its characteristics. The classification results of this implementation are: correctly classified – 91.77 %, incorrectly classified – 8.13 %.

This paper has described an approach for automatic classification of web pages that uses the structure of the page. The results obtained are quite encouraging. This approach could be used by search engines for effective classification of web pages. Our current implementation uses OAT for data processing phase and decision trees for classification phase. A neural network could be employed to automate the training process. Adding a few more attributes based on heuristic would increase the classification accuracy.

This approach could be used into very broad categories. The same algorithm could also be used to classify the pages into more specific categories by changing the attributes set.

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THE FUTURE INTERNET

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Humanity lives in the information age. No one can imagine his life without computers, smartphone and the Internet which have become the cornerstones of our society. We use them for work, education, communication, entertainment, for just about everything. Modern World Wide Web contains more than 4 zettabytes (4 billion terabytes) of data and every day it only increases, so we face the situation that the more data we have the higher bandwidth we need. Let's think about our life with the 100 times faster Internet. How would this super-fast connectivity affect the way we live? What technology can afford to bring it into life?

Predictions about what the Internet could be in future, with extremely fast connectivity, are fairly optimistic. Many specialists are concentrated on telepresence technology, which could unite people together. We will be able to take part in

the conference, visiting exhibits, travel the world and meet interesting people – all from the comfort of our own houses.

Other sector that can be improved with higher bandwidth is virtual reality. Internet specialists are thinking about future filled with avatars, interactive gaming and holograms. Height speed Internet will allow humanity and machines to be closer together by the "Internet of Things". With ultra-high speed Internet, smart gadgets won't be just a stylish accessory, they will be the standard. Internet connected objects, from lights to home appliances and tracking systems will be used in the house to help owners remotely control and monitor it. Health monitoring systems will allow people to stay under supervising of their doctors. Wearable sensors will control patients' state of health and measure their temperature, hydration and body motion. These systems will be similar to your home security systems.
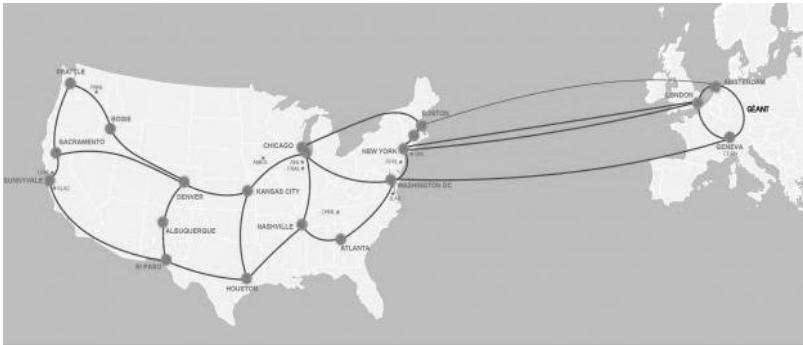
Technology that will make the Internet much faster is ESnet – "The Energy Science Network", which is now used by the scientists all over the world. It provides fast and stable connections that link research institutions, allowing them to collaborate on the world's most important scientific problems such as green energy, global climate and the origins of the universe. As computer software ike, simulation and visualization become more precise, they also require the processing of greater amounts of data using real time cloud computing. Large laboratories have access to ESnet that can support 100Gbps transfers speed. While 100Gboptic links are quite old, ESneth as no equal because it can provide fast end to end transfer speeds that are close to the physical maximum. Last year, ESnet carried a data transfer speed of 91Gbps. 11 gigabytes of data were copied in one second in a distance of 1700 miles, from one research center to another. For now, this is the fastest communication ever created. The IEEE– "Institute of Electrical and Electronics Engineers" is currently developing modern network standard which allow transferring data with speed up to 1000Gbps.

Finally, the biggest problem, why we don't have that kind of speed in our Internet, is a complexity of connecting every consumer with this 100Gb links. But fortunately, the science does not stand still which means technologies that allow us to introduce gigabit connections into society, will appear in the near future.

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WIRELESS SENSOR NETWORKS: THE FUTURE OF MANKIND

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Today science is a big step forward. People have developed microcomputers and microprocessors and have created robots that can analyze the received information, etc. Various new algorithms as solutions to certain problems have been developed. It is impossible to list all the innovations because they appear every day.

One of these new technologies is "Smart Dust". "Smart Dust" is a technology for wireless sensor networks. Originally designed for military use sensor networks have been actively used for civil purposes. Today the market is actively developing wireless sensor, ZigBee Alliance which includes more than 100 companies was created to support the new technology for industrial purpose.

This technology is so versatile that it can be used in almost all spheres of human activity. The wide range of sensors are able to control various parameters (temperature, sound, motion, pressure, etc). The ability to transmit data from one node to another allows us to deploy a network for thousands of square kilometers. For example we can monitor vital parameters of seriously ill people in hospital and can process in any place we want. And we have a lot of such examples.

The main objective in the development of these projects is to provide reliable communication, fast delivery of data packets with the minimization of energy. So far the issues related to the creation and deployment of sensor networks are subject of many works mostly of foreign authors. Scope of works extends from very specific issues related to the creation of separate components of network facilities (transceivers, microcontrollers, sensors, etc.) with low cost and low power consumption problems that arise in the operation of sensor networks.

The WSN is composed of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors.

A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have to be created. WSN is a wireless network in which the information is transmitted from one node to another until the packet reaches the remote gateway. Gateway information goes to the host system that performs information processing or transmitting it further.

Motes are usually in the size of about one cubic inch. The processor, flash and operational memory, digital-to-analog and analog-to-digital converters, RF transceiver, power supply and sensors are placed on the board. Sensors can be different; they are connected via digital and analog connectors. Temperature sensors, pressure, humidity, light, vibration, are more used than permanent magnet, chemical, sound and others. A set of applied sensors depends on the functions performed by the wireless sensor networks. Powered motes are carried out from a small battery. Motes are used only for data collection, initial processing and transmission of sensor data.

The main functional data processing is performed on the node, or gateway, which is a very powerful computer. The problem of receiving sensory information collected from motes is solved this way. Motes can exchange information among themselves using transceivers working in radio. Firstly, this is sensory information read from the sensors and secondly, information about device status and results of the data processing. Information is transmitted from one mote to another chain and eventually comes to the Gateway motes and dumps it the accumulated information. If a part of motes fails, the work on sensor network

reconfiguration should be continue. But in this case the number of information sources of course is reduced.

The study of such systems is of great interest to us due to a wide range of applications of sensor networks.

Computer science and telecommunications wireless sensor networks are an active research area with numerous workshops and conferences arranged each year, for example IPSN, SenSys, and EWSN.

Prospective development of wireless sensor networks is obvious. Already many industries are beginning to use WSN. This includes monitoring the environment, auto traffic, weather monitoring. With improved technology and complications of various industries, need for wireless sensor networks will only grow.

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BUILDING COMMAND LINE APPLICATIONS IN PHP

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PHP is a excellent language for fast and low cost programming web applications. Many people know this. But many of us don't know of is that it can also be executed as a console applications like c, java, etc. Questions may occur why we have to work with PHP on the command line?

In addition to creating web app, there are many other problems which should be run on the background. Most of these types of problems may take several minutes to many hours.

For example, sending newsletter email to all the subscribers in a mailing list. Can not we do this with a common scenario in PHP? Yes, we can do it using a standard web programming. Nevertheless, it will work well only if there are several hundred subscribers. What if there were a million subscribers? More generally, any web script will have only a few minutes to perform. This period of time is known as maximum run time. After that, the web server stops the script.

The maximum run time must be set as 4-10 minutes, and it may vary on the configuration server. In this case, your script can only send several hundreds of letters within a given period. So it not feasible develop an application that to send email in PHP? Yes, but it is suitable for PHP command-line scripts.

In contrast to the web browser, command line scripts do not have a maximum period of performance, and they can work as long as they can, if until the server turns off.

Here's a list of important differences between server-side PHP and PHP CLI:
1. There are no super global arrays:
    – *$_GET*
    – *$_POST*
    – *$_COOKIE*

2. When you do a *print*, the output goes to the *standard system output* and not a browser.
3. You can get command line arguments via the *$argv* variable and the number of command line arguments via the *$argc* variable.

Below is an example PHP-CLI program:

```
<?php
    if (isset($argv[1])) {
        echo "Hello " . $argv[1] . "\n";
    }
```

If we saved this as "hello.php", then we'd run this PHP CLI program via the command:

php hello.php World

This would produce the output: *Hello World*

Despite the widespread opinion, PHP is not just the language of the server programming.

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GREEN INFORMATION TECHNOLOGY

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Green computer calculations or Green Information Technology pay our attention to the problem of the impact of operating computers and IT on the milieu. Green IT – is a knowledge and practice of design, production, use and removing of computer (computing) devices and joined subsystems such as monitors, printers, storage devices, networking and communications systems - in order to work advisably and productively with minimal or zero impact on the milieu.

Tasks in Green IT is the same as that of Green Chemistry:
−   maximize energy advisably throughout the product life cycle;
−   reduces the use of hazardous substances materials;
−   encourage the development of technologies, which returned the product, recycling the materials and reusing them (recover-reuse-recycle). These technologies require full understanding of life cycle of the product, but not the cost of production and distribution, processing, destructions.

The necessity in a computing power is growing up and approach of virtualization computing helps to satisfy its increase by concentrating computing resources. Tasks are resolved not by a computer user, they are resolving by enterprise servers and storage processing or foreign, commercial servers. In this case, the user's computer may have low capacity and is intended only to show the result of remote computing. The server can simultaneously perform multiple computing tasks; can run hundreds of applications (programs) in parallel. The Internet is used to communicate with servers.

Server technologies in use:
− database storage company customers and work program for the issuance of requested data from this database,

− storing documents of the company and team project (contract, orders, schedules, videos, specifications, etc.)

− grid computing with 3d-visualization

− accommodation websites, and much more.

The server – this is the essence of the theory of information systems, in reality – this is the room in which the installed computer and network equipment and made the conditions for continuous and reliable operation of the equipment and storage systems. Unified Computing Center perform tasks that previously were placed on a small server − we start working with the Data Processing Center (DPC).

Why do we pay attention to the data center? Because they are one of the largest consumers of electricity in the IT industry and provide many opportunities to use Green methods. In modern high-rise buildings, office centers entire floors are allocated for the data center, which includes their competent in designing a comprehensive approach to the creation of energy efficient and environmentally friendly buildings.

A late IDC investigation states that the power consumption and cooling data centers are the main concern of DPCs, of which 21.8% have called it as their primary concern.

Improving the energy efficiency of technical systems - is a part of strategies to reduce the anthropogenic affect on the milieu. After consuming less energy we burn less fossil fuels and, consequently, reduced emissions and CO_2.

To estimate the energy ingestion in the data center using indicator PUE (Power usage effectiveness), the numerical value of which is calculated as the ratio of the total amount of energy taking by the data center to the amount of energy consumed by the IT equipment itself. This metric is used along with an indicator DCiE, which were proposed by combining IT companies - Green Grid- as a method of assessing the effectiveness of IT. The effectiveness of energy productivity measures to improve data center is visible indicator.

A major challenge is to take a large amount of heat released by the computer equipment. This number increases with increasing power of computer systems and the density of the layout. Green approaches can be realized while designing the cooling and ventilation systems green approaches, innovative solutions, which are enable to save money and reduce the impact on the milieu.

The urgency of these tasks is that the modernization of the DC is much cheaper than its restructuring.

All the leading manufacturer represents their options for computer data centers and communications equipment and software, which organizes the operation and management of information systems.

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WHY DO WE STILL USE PASSWORDS?
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Have you ever thought that using password for security purposes is a primitive and backward technology? Every day we use dozens of different services requiring key words of different types, length and protection degree. For each of our bank card we have to

remember four digits, frequently not associated with any of our life events. We use public sites on internet, access accounts on our computer work places, simply unlock personal mobile devices and always need to enter letters, digits and special symbols only to be verified by the security system. The approach is so popular that there are whole branches of science aimed to protect and hack this type of systems.

Why do we still use the technology while the action movie actors prefer to access the strongly secured objects using their biometrical characteristics such as fingerprints, retina or simply voice? This always seems more effective and much more convenient. The first answer appearing in our mind is the level of development is not high enough to embed it in our everyday life. Yes, probably. Many of the biometrical authentication methods are still going through the phase of deep research. But the dactyloscopy (fingerprint identification) has been used for more than a century and nowadays the humanity has certain experience in the branch. So, let us try to find out more reasons why the innovative methods haven't been integrated yet.

The first and main reason is reliability. Every biometrical method admits the possibility of error occurring – false acceptance of "foreign" person and false rejection of the real owner. This happens because even if biometrical characteristics of any two persons are different (which is not proved, for example, for fingerprints) they can be so similar that may be interpreted by system as totally identical because of measurement or calculation error. Also it should be mentioned, that some characteristics may change with time and/or life conditions. For example, growing a beard may be a problem for 2d facial recognition and working with sharp details can defect your fingertips.

The next problem is cost and usage convenience. The known thing is that DNA or retina analysis has a great level of safety and accuracy. But requirements are high as well. Can you imagine yourself scanning your eye every time you need to log into your online banking or to buy a bottle of water with your credit card? Upgrading security of enterprise with limited number of participants seems reasonable. But not affordable for wide audience.

Speaking about biometric authentication we admit the advantages of the absence of additional security attributes. The person is the key by itself from birth till death. But this also can turn bad when the example of biometric characteristic (for example, fingerprints or palm scan) is trapped by wrong hands. This is a serious potential danger even if you know about the sensitive data leak. In this case using password gives you an ability simply to change it. But the trick does not work with retina or palm veins…

Basically the provided reasons are not strictly theoretical. The attempts to integrate the biometrical innovations into security systems are stably invoked in different enterprises, companies or simply for scientific purposes. Combining, improving and applying of new methods give us new results and one day they will be acceptable for humanity to be trusted. But for now… keep you passwords safe!

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AUDI LED TECHNOLOGY GOES INTO MASS PRODUCTION
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In early 2015 the Ukrainian market will receive the latest restyled model A8 by Audi. This is the first model of Audi, which has a revolutionary optics – Audi Matrix LED. Dot Matrix LED lights provide great opportunities to change the parameters of the driving beam, and can adapt to any road conditions, for example, in the future, this technology will be able to make rain "invisible" when you turn on the headlights. Basis of each lamp contains 25 LEDs that are arranged in groups of five LEDs each. Every group has its own reflector lens. All 25 diodes are controlled by computer, that controls either the switching on and off, or their brightness, each separately.

To adjust optics to road conditions, the light must be turned in an automatic mode. In this case, the system takes control of light itself within the city, when the car is moving at a speed exceeding 59 km/h, and on the highway at a speed greater than 29 km/h. System is safe, because it recognizes oncoming vehicles and does not affect their movement. To avoid glare of driver, which moves opposite to the car, matrix disable individual diodes or reduces their brightness. But, at this moment diodes don't illuminate only the oncoming car, the other objects on the road are clearly visible and lighted. The closer is the oncoming car, the faster the switching diode keeps the shadow in the right place to control the size of the place [1].
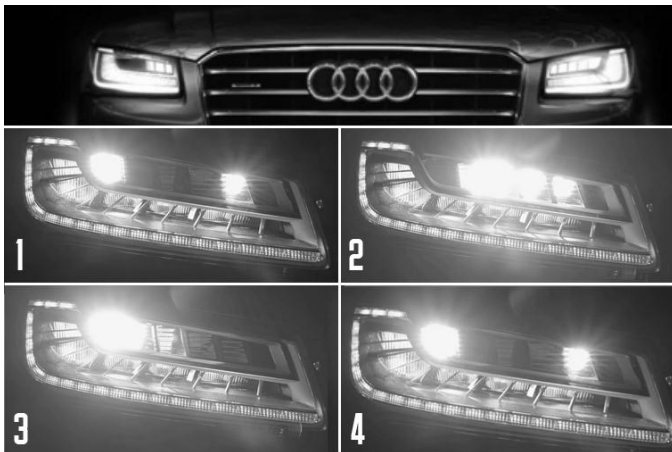
Audi is one of the first car companies-giants who took up the development of "smart" xenon adaptive lights, and a fully diode headlights. Logical continuation of this development line is the introduction of matrix headlights on all models of Audi.

The creators of this technology believe that it is much more effective when compared with a similar analogy headlights with moving mechanical mask. The computer responds instantly, in comparison with the mechanics. Functions of Matrix LED from Audi are not limited to prevent glare of oncoming cars. This system can detect pedestrians who are dangerously close to the car, at night, using night vision device, which communicates directly with the headlights. After their interactions headlights get the coordinates of the person in danger and respond with a very bright beam of light – "highlight" the pedestrian with the quick flash 3 times, so the driver can distinguish the pedestrian from the general background. Thus, the system warns the driver and pedestrians about the danger [2].

But these are not all functions. The third function of Matrix LED are light turns. It works even before the turn of a rudder. The system receives navigation data "MMI Navigation Plus", processes them, and when approaching to a turn in advance it changes the brightness of the diodes and their direction displace the light beam in the direction of a turn.

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MODIFICATION OF THE GL-MODEL BY CHANGING THE RIB FUNCTION
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Increasing capacity and computing capabilities of computer technology causes an increase in the complexity of the technical complex structure, which in turn makes the reliability analysis of computer systems more complicated. Reliability calculation is an essential part of the complex computer systems development. Besides, the most important problem is the analysis of such systems to determine the most loaded and vulnerable places in architecture predict and simulate the system response to the emergence of a faults variety.

Different methods of mathematical modeling are used to study the fault-tolerant multiprocessor systems (FMS) behavior in the stream of faults. However, most of the conventional methods require a relatively large amount of computational resources and time.

The method of FMS analysis using graph-logic models (GL-models) allows conducting of static experiments with use of the available computing resources for relatively short periods of time.

GL-model uses the properties of graphs and Boolean functions. It implies the attribution of Boolean functions to the graph ribs, which depend on the variables that display the state of the systems processors (serviceable-defective).

The presence of the appropriate rib in the graph model depends on the value of rib Boolean function. So, the model graph structure changes with the system state vector. Connectivity of the graph shows the performance of the FMS, which is modeled by GL-model. FMS that is directly failsafe for the certain multiplicity faults is called the basic FMS. The GL-model graph of the basic FMS is cyclic.

Since real systems are often not the basic, then to adequately display their behavior in a stream of faults there is a problem of modifying the basic model.

There are three types of GL-models modification: a change of the graph structure of the GL-model, a change of its ribs function and a joint change of the both. The method proposed in the report is to modify one part of one rib function of the model.

As a result of such modification on a set of vectors with m+1 zeroes, where m – degree of fault-tolerance of the initial basic system, the model graph does not lose connectivity, that corresponds to the operating state of the modifiable system. Dependencies between modifiable function and the set of blocked vectors are shown.

DIE LEXIKALISCHEN ASPEKTE DER GESELLSCHAFTSPOLITISCHEN VIDEOREPORTAGEN
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Während der wissenschaftlichen Arbeit haben wir nicht nur die Definitionen von gesellschaftspolitischen Videoreportagen als einer Textsorte, sondern auch die Besonderheiten deren Lexik untersucht. Das Forschungsmaterial bildeten 20 deutschsprachigen Videoreportagen vom Media-Center"Deutsche Welle„. Nach Busel [1] ist die Videoreportage die Information, die Erzählung oder der Bericht über die Tagesereignisse, die veröffentlicht oder im Fernsehen oder per Radio übertragen werden.

Als Hauptmethoden für die Untersuchung der lexikalischen Aspekte in den Videoreportagen wurden die Methoden der Beschreibung und der Analyse, die mathematischen und verallgemeinernden Methoden angewendet.

In der Forschungsarbeit wurden umfangreiche Erkenntnisse gewonnen. Die Texte der gesellschaftspolitischen Videoreportagen zeichnen sich durch viele lexikalische Besonderheiten im Deutschen, deren Übersetzung ins Ukrainische von großer Bedeutung ist. In der Untersuchung haben wir die Häufigkeitstabelle der Verwendung verschiedener Lexik mithilfe der einfachen Formel gebildet, indem die Gesamtzahl in 20 Videoreportagen als 100% bezeichnet ist (Tabelle 1).

1. Lehnwörter (der Separatist, die Reform, die Chance, das Trauma, der Bandit).

2. Eigennamen (Matthias Ilgen, Werner Stubenrauch, Martin Weber, Deutschland, Europa).

3. Politische Fachwörter (die Demokratie, der Präsident, die Unabhängigkeit, die Regierung).

4. Wirtschaftliche Fachwörter (der Staat, die Fraktion, die Infrastruktur, das Parlament).

Es gibt auch eine andere Art der Lexik, wie zum Beispiel:

1. Synonyme (die Banknote – der Schein – die Note, der EU-Staat – das EU-Land).

2. Antonyme (die Fälschung – das Original, die Ausreise – die Einreise, der Pessimist – der Optimist)

3. Abkürzungen (die EU, der NATO-Chefwechsel)

4. Redewendungen (Modus Vivendi, etwas an den Nagel hängen, die Sau rauslassen)

Tabelle 1

Die lexikalischen Besonderheiten der Videoreportagen

Die Lexik	Die Häufigkeit, %
Synonyme	0,36
Antonyme	0,12
Lehnwörter	4,1
Politische Fachwörter	1
Wirtschaftliche Fachwörter	2,2
Abkürzungen	0,3
Eigennamen	1,5
Redewendungen	0,2

Die Gesamtzahl der untersuchten Wörter in den Texten: 10792.

In Bezug auf vorliegende Erkenntnisse können weitere Untersuchungen durchgeführt werden. Die durchgeführte Forschung ist aktuell und umfangreich, weil sie den Überblick über die moderne deutsche Sprache und deren lexikalische Vielfalt in den Massenmedien darstellt. Eine vergleichende Analyse der lexikalischen Aspekte kann in den gesellschaftspolitischen Texten anhand der Videoreportagen für Sprachenpaar Deutsch-Ukrainisch durchgeführt werden. Die Erkenntnisse dieser sowie weiterer Arbeiten sollen eine fundierte Grundlage für praktische Seminare und praxisbegleitende Vorlesungen bilden.

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BRAIN-COMPUTER INTERFACE
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Development of a brain-computer interface (BCI) is one of the most advanced branches of science of the last decade. This technology will allow us to transmit signals

directly to someone's brain. So individuals with severe disabilities will find the opportunity to see, hear or feel another specific sensory input.

The history of BCI development started in 1924 when Hans Berger made the first electroencephalogram recording. In 1998 first implant in human brain produced high quality signals. Active development of BSI is conducted in recent decades.

The work of our brain is based on the neural connections. Neurons interact with each other via dendrites and axons. Our neurons are constantly working. Differences in electric potential carried by ions on the membrane of each neuron generate small electric signals. Myelin insulates electrical signals path, but some of signals escapes. Researches detect them, interpret their meaning and use those signals to direct a device of some kind. It can also work the other way around.

Attaching to the scalp a set of electrodes (an electroencephalogram) is the easiest and the least invasive method. Brain signals are read by electrodes. However, the skull blocks and distorts a lot of the electrical signal that makes it difficult to get an exact image. Way out is to implant electrodes directly into the gray matter or on the surface of the brain. Then we get a higher-resolution signal. Differences in the voltage between neurons are measured by electrodes. Computer amplifies the signal. After that special software filters, processes and interprets it. In the case of a sensory input BCI, the function happens in reverse. There are another ways to investigate activity of a brain, for example, Magnetic Resonance Image technology. An MRI machine produces very high-resolution images of brain activity. It is possible to use MRI machine to get benchmarks for certain brain functions but it can't be used as part of a permanent BCI. The promising area of BCI research is a development of devices controlled by thoughts. It allow individuals with severe disabilities to function independently. For example, quadriplegic can use just mental commands to control a computer cursor. The most common and oldest way to use a BCI is cochlear implants. A cochlear implant bypasses the non functioning part of the ear, processes the sound waves into electric signals and passes them via electrodes right to the auditory nerves. To solve the problem of vision we need to implant electrodes into the visual cortex. Otherwise the behavior is similar to the previous case.

Unfortunately the basic principles behind BCI's don't work perfectly. There are several reasons for this: the complexity of the brain, weak signals and bulky equipment. After solving these problems the potential uses for the technology will be almost limitless.

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THE GRID: ARTIFICIAL INTELLIGENCE AS YOUR PERSONAL GRAPHIC DESIGNER

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How about making a unique website that do all the work in a few simply steps? Technology these days has progressed so much and without technical knowledge, you can have your own website up and running, within a couple of minutes. An API uses artificial intelligence can realize all your desires immediately in a quality website. This application gives an opportunity for everyone to create a modern website using the platform and it doesn't depend on your skills. It's target is to give any user who wants to demonstrate his abilities or promote his business using a great site, a chance to make this website without a fear of disappointing results. This application is The Grid and it introduces the new idea of

creating beautiful websites with the help of artificial intelligence. It's actually very easy to build a successful website. The feature of this API is an autodesign. It means that you post something to the website, engine measures, fixes the content and represents elegant website.

Show who you are with the original site. Deal with the time-consuming work: the website could do this work itself. The API doesn't use templates, only stylish, modern layout filters. A website created by The Grid can adapt and regulate content.

Creating a website involves the following 4 steps: become a founding member, register a domain name, get a web host, build your website. And start with choosing a design. This application works in the following way: everything you upload in it – movies, pictures, texts, links is automatically adds. Just drag and drop. It is when you "grab" an object and then drag it to a different location. The user can easily add, remove, change and organize settings. You needn't know anything about programming languages. Don't wasting time for cutting pictures; it cuts pictures for any size you want. Add a dynamic map and a simple contact form to organize a useful and attractive experience for your site's visitors.

How you make your site will depend on the kind you want to do. For example, you can work for an e-commerce site. Launch e-commerce attributes as purchase price and your site will make it with his opportunities. If you want to generate a blog, just use some of the built-in filter for the blogging. In addition, the customer can transfers an existing website.

The group behind The Grid founded in 2010: Leigh Taylor, Dan Tocchini, Henry Bergius. Creating platforms by templates take o lot of time to make something you would be proud of. They are grateful to the professional photographers for their contribution: Jeffrey Woods, Folkert Gorter, Paul Audia. AI is the cutting-edge of computer science and today it has become an essential tool to solve the most difficult problems. A kind of this research is highly technical and specialized, effectively take care about your mark and introduce it in the best light. A design shapes your content, not the other way. Looking for fresh solutions? Go live with a simple click.

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CLOUD COMPUTING

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In recent years, the IT-community usually believed that modern cloud services could consciously decrease costs, and today many corporations are increasingly moving their enterprise systems and commercial software in the cloud.

All the difficulties of cloud calculating straight cognate to them features: remote, spre ad, collateral, abstraction, and so on.

Cloud computing or cloud systems − a typical to ensure common and expedient access necessary, as the network system as a common launching of calculating resources to

be setting (communication networks, server`s, mass storage, software andservices) that may be promptly granted and made with minimal managerial costs and provider applications.

When expending cloud software provided to the user as internet application. The user has access to their enclosed data, but cannot control and should not worry absolute the organization, operating system and programs with which it works.

"Cloud" symbolically called the internet, which hides all the technical specific's.

Accordant to the document iEEE, published in 2008, "Cloud systems − a class in which information is always stored in servers on the internet and temporarily cached on the user side, such as private computer`s, game support`s, notebooks, smartphones, etc.".

Cloud systems are highly flexible and be able animatedly expand to occur the desires of its users, and that the systems furnisher provides hardware and program required to operate. There is don't want for position which may extend expand its resource`s or transfer its personnel to govern the service, instance of cloud technologies contain online data preservation and backup, web service's hosted email service office collections and collaborate on document`s, database processing, operate support services and more.

More often than not samples of cloud systems characteristically fall into community cloud paradigm as they, by explanation, in the open domain. Software as a Service (SaaS) proposal`s, sort of cloud system and online application's, office programs is likely the famous. However, extensively approachable infrastructure a service (IaaS) and Platform as a Service (PaaS) offers, together from those built on cloud technologies internet hosting also automated software development surroundings be able copy the model as well. Personal cloud`s extensively the most used in ruling's for persons who rarely wanted level of establishment and protected presented by the person cloud. But, the company can still use the opened cloud to do their procedures much more effective, such as, from conservation of no personal information, work together online documents and email.

Open cloud environments have certain features and positive aspects:

Overall scalability of the cloud system are accessible upon request from the unlimited resource support for cloud system, so designed software that operates it can easily respond to changes in performance.

Cost value of open clouds compose the amount of resources can use the scale. Central process and administration of basic resources is common to all cloud technologies although component`s such as servers claim less parameterized on demand. Some common proposes may even charge to the customer, is dependent on skis on open intercourse for them income.

Dependability and a huge the number of servers and networks participating in the embodiment of open cloud systems and storage format means that if one material ingredient has failed. Cloud systems will continue to operate other components do not suffer losses and, in sometimes, when the clouds attract resources from multiplex data centers. Data center goals can work independently of each other, and some cloud systems does not tormented from negative influences, that is, no centralized location of failure in the system to make the system vulnerable open cloud.

Suppleness there is not a countable number of IaaS, PaaS and SaaS technologies in the market that follow the patterns of cloud systems open and available as a service from any hardware with connection to an Internet. These applications can perform most calculating tasks and can bring their charity for private and corporate clients. Companies can even accomplish public cloud systems and close clouds, where they have to perform closed business processes for the formation of hybrid clouds.

Emplacement objectivity general existence of cloud technologies by binding to the Internet provides the position of services where necessary. It ensure invaluable opportunities for enterprises or for example distant entrance to IT infrastructure or document cooperation from multiplex locations online.

Closed cloud is an instrument that is utilized to carry out cloud system programs, which is executed with in the joint firewall, below manage of the IT section that has access to the full manage of cloud surroundings.

Close access cloud appointed to suggest the similarly features and preference of the open cloud, but removes some differences against open cloud technologies models, through private manage over the business and client data rives high protect and problems related to regulative demands, and equal access.

Protected cloud security. Cloud environments make to depart the many denial to the security of cloud system. Because close cloud installations realize reliably in a common network, close cloud ensure control to the company, and it provides protection, however with great potential danger to data deprivation because of the various negative impacts of natural disaster.

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MEMORY ADDRESSING

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Nowadays we use different types of memory. As usual, this types refer to architecture of INTEL IA-32. In our time of Hi-Tech, the issue of memory addressing has become an actual problem. If we want to get some data, which is located somewhere in memory, we need to determine its address. For a variety of reasons, which will become apparent in the course of reading this article, the source address encoded in the instruction passes through several transformations. We will follow through this whole chain of transformations to find out why the number of final address has such a specific structure.

Physical address

The final result of all the transformations of other types of addresses that are listed below in this article is the *physical address*. The work inside the CPU of address transformations finishes here.

Logical address

Without knowing the number of segment parameters in which the effective address is specified, the latest is useless. The segment itself is chosen by one more number called the selector. A pair of numbers is written as selector: offset, was called the logical address. As active selectors are stored in a group of special registers, it is often that instead of the first number in the pair is written the name of the register, for example, ds: 0x11223344.

Usually those who face with these concepts for the first time are quite confused. To simplify (or to complicate) the situation helps the fact that almost always the choice of the selector (and the related segment) is based on the "meaning" of access. By default, if in the

encoding machine instructions is not specified other, to obtain the code addresses it is used logical address selector CS, for the data – with DS, for the stack – with SS.

Linear address

Effective Address – is displacement from the beginning of a segment – of its base.

Transformation logic – linear may not always be successful, as while its running is checked several conditions on the properties of a segment recorded in the fields of its descriptor. For example, it is checked the output for the segment boundaries and access rights.

What affects the paging

However, the general idea is always the same: the linear address is devided into several parts, each of which serves as an index into one of the system tables stored in memory. Entries in the table – it is an addresses of the beginning of table of the next level or to the last level – the desired information about the physical address of a page in memory and its characteristic. The least significant bits are not converted, and used to address within the page found.

In various modes of the processor varies the number and capacity of these tables. Conversion can fail if another table does not contain valid data, or access rights are stored in the last of them, prohibit access to the page; for example, when writing to the regions marked as "read only", or trying to read kernel memory from unprivileged process.

Guest physical

Before the introduction of hardware virtualization in Intel paginal conversion (transformation) was the last in the chain. When several virtual machines operate on one system, physical addresses got in each of them, it is necessary to compile another time. This can be done by software or by hardware when the processor supports the functionality of the EPT (Engl. Extended Page Table). Address, formerly known as physical, was renamed the guest physical in order to distinguish it from the present physical. They are connected using EPT-conversion (transformation).

Conclusion

The evolution either in nature, or in the technology – a strange thing. It generates unexpected structure, inexplicable in terms of sustainable design. Its creations are full of atavism, the rules for their behavior sometimes consist almost of exceptions. In order to understand the operation of such a system it is often required to replay its evolution from the beginning, and under heaps of all layers to find the truth in the form of the principle of "nothing to throw away." I incline to believe the IA-32 architecture, a remarkable example of evolutionary development.

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DEVELOPING APPS WITHOUT WRITING SERVER-SIDE CODE
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There are many consumer and enterprise applications can be represent as "client-server apps", which divide into the client-side (frontend) and the server-side (backend). The client-side is the view, what user can see. For example is a web-page or any GUI of program in your computer or device. The frontend is responsible for guiding the user through the workflows established and send to the server-side requests. The backend consist of two important components: application business logic and data processing/management.

It is very weighty division of the server-side into application business logic and data processing/management. The data processing/management is part of application which operate with data. The business logic is the interaction between the client-side, the data processing/management and the logic what developer write in his program. It is very important that application would have only one backend with once written business logic and has many client-side view.

Providing backend as a service includes defining special communication protocol. This protocol declares data structures as well as data flow between the frontend and the backend. These data structure definitions and the protocol create special interface, Application Programming Interface, which is used by client-side to communicate with the server side. There are a lot of different API formats. For example, REST is a generic format which can be used for communication between client applications (mobile, tablet or desktop).Other APIs formats could be built only for particular platform or programming language.

Since the backend services are common and all client applications have specific business requirements, the problem appears of where to place the business logic. Using the APIs developers leverage the server-side services in order to accelerate the development process. Client apps could use the APIs to drive the data management or processing functions which take place on the backend.

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REINFORCEMENT LEARNING

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Artificial intelligence (AI), as an independent branch of computer science, emerged in 1950s of the last century. In a short time AI has significantly developed, and now within this branch they conduct active research in the following areas: development of intelligent information systems, development of natural language interfaces and machine translation, generation and speech recognition, *machine learning*, pattern recognition, games and computer art, AI systems software, new computer architectures, and intellectual works.

Machine learning (ML) is one of the most important sections of AI. ML examines methods for constructing models that are capable of learning, models constructing algorithms and algorithms for learning. The ultimate goal of ML is to automate (partially or completely) solution of complex problems in various areas of human activity. Depending on the mode of learning, there are three main methods:

(a) *Supervised learning.* In this method, foregone answers are set on a multiplication of objects. A training sample pair "object-answer" is named a teacher. The objective of such training is to find a law under which you can find answers to any object. Algorithms of such a type are used to solve problems such as prediction and classification.

(b) *Unsupervised learning.* It is similar to supervised learning but with the difference that at first answers are unknown. The purpose of this training method is that an algorithm itself can be trained on small samples which it selects itself and which it needs. This is mainly used when solving tasks such as clustering and identification of interactions between observations.

(c) *Reinforcement learning.* In this case, the foregone correct answers cannot be known at all, and the algorithm tries to find its own optimal strategy.
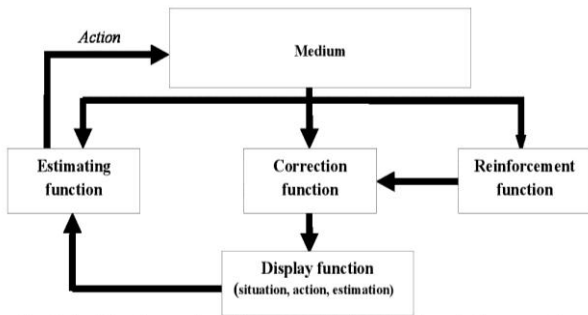
Fig. Principle of operation of systems which utilize the reinforcement learning

In this method of learning, the correspondence between situations and actions to be taken by a controlled object (*agent*) in one situation or another, is memorized. The initial training sample is not needed: it appears in the course of the object operation as a result of a random search in the states of space. A general scheme of reinforcement learning is shown on the figure.

The agent and *medium* interact at each step of a serial of digital steps, at each of which the agent gets some idea of the medium condition. Based on this condition the agent selects an action. During the next step, as part of an answer to the action, the agent receives a numerical reinforcement and switches itself to the next condition. Reinforcement is a number that is a direct estimate of the medium of the action performed by the agent. It may be negative, i.e. it may be a punishment.

At every step, there are displayed conditions for the likelihood of selecting each action. This display is called the *agent rules*. The agent changes its rules as a result of a new knowledge. It is important to note that reinforcement is an estimation of the agent actions only in the short term. The ultimate goal of the agent is to get the maximum final amount of reinforcement obtained during long-term operation.

The described method of training is the simplest and at the same time the most difficult to implement. For the agent models, every stage of the method, every action, strategies and functions, a certain quantity of various approaches is developed (and being extensively developed) a variety of approaches. Thus, for formalization of the ultimate goal of the agent: maximizing the reinforcement amount, they use finite horizon models, infinite horizon models and average reward models etc. Also, there are some strategies and payoff functions. To determine an optimal payoff function they use a dynamic programming method, the Monte Carlo method.

They also use combinations of these methods: Temporal difference learning methods (TD-methods) which are a combination of the dynamic programming method and the Monte Carlo method. Like the Monte Carlo methods, TD-methods do not require full information about the medium and utilize the results of direct interaction between the agent and the medium. But unlike the Monte Carlo methods, in these methods, values of the payoff functions are available at every step and refined over time. However, as the method of dynamic programming, the current estimations for calculation of new estimations are used. To the TD-learning methods are referred the Q-learning and Q (λ) – learning methods.

Despite the complexity of implementation, the ML methods are successfully introduced in a variety of software products. For example, they are used in the speech and text recognition, image recognition, technical diagnostics, medical diagnostics, for detection of a credit card cheating, for spam detection, for the stock market analysis, and classification of DNA chains.

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WAYS OF TRANSITION OF EXISTING TELECOMMUNICATIONS INFRASTRUCTURE TO IP PLATFORM IN ACCORDANCE WITH IMS CONCEPT

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One of the main objectives of the IMS concept is to provide a gradual transfer of existing telecommunications infrastructure in advanced IP platform. The emergence of IMS (IP Multimedia Subsystem) is associated with the problems of interaction of network equipment from different manufacturers. In particular this applies to the incompatibility of SoftSwitch equipment from different manufacturers to be charged with addressing the major challenges in the management of telecommunication networks.

IMS concept is a set of regulations for transformation of NGN networks with packet voice and data in real multi-network, converged with any other networks. IMS is a standard IP − architecture that enables convergence of fixed and mobile telecommunications networks, the interaction of different types of networks and multimedia applications. IMS allows providing integral service of all kinds of messages − voice, text, images and videos, regardless of the type of network in which subscribers are terminals. The service process requests, and the interconnections of various subscriber networks (e.g., the analog network and the packet-switched network) is carried out through the open standard interfaces. This allows simplifying the system and reducing the cost of the ownership.

The IMS architecture assumes the existence of several independent modules that share common resources. These modules can be added to the general system or excluded from it. Moreover, the modularity of implemented and horizontally, that is respected the autonomy of services, and vertically − separated levels of transport, control and applications.

In the IMS system classic SoftSwitch, providing control over the traffic at the connection point of the access network is replaced by multi-service platform with a set of proxy servers. Each server manages the retrieval and services of a certain type has its own interface to the transport network.

In this case, all servers are connected to a single database. It contains information about the profile of subscribers, traffic and services. At the base there is an external interface that allows third-party providers to obtain information necessary for the mutual.

System media servers and gateways, it is in the form of building blocks that enable equipment vendors and developers to create a cost-effective, modular, highly available, scalable solutions.

IMS-architecture requires a clear division into levels, each of which represents a set of logical functions performed during the service received the application. As a rule, there are the following three levels (see Fig. 1):

- the level of transport and consumer services;
- the level of call control and communication sessions;
- the level of services.

Consider the problem of each level.

At the level of transport and consumer devices solve the problem of combination of analogue, digital and broadband formats. For this purpose:

− to ensure the transformation of speech from an analog or digital-to-IP-packets;

− convert telephone flows format TDM traffic flows in VoIP. Solving these problems

involves the conversion of all types of user traffic in IP-packets with protocol RTP (Realtime Transport Protocol), and all kinds of data to the signaling protocol SIP.
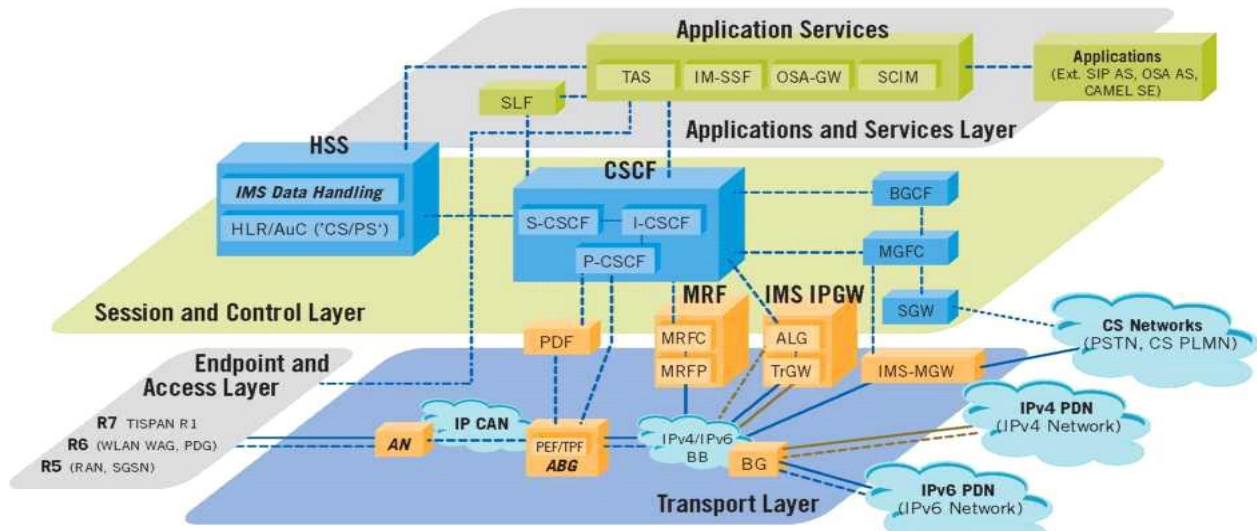
Fig. 1 IMS architecture

Media servers also support Non-telephone telecommunication features, such as replicating media to provide instant service multipoint (PTT - push-to-talk).

Since media servers are common to all applications, it maximizes the use of statistical indicators of equipment and establishment of a common framework for media services without rigid binding equipment to services and applications.

At the level of call control and communication sessions to ensure control logical links between the various network elements. Here, problems are solved by endpoint registration, message routing SIP, overall coordination and problem solving signaling. The main elements of this level are:

- CSCF (Call Session Control Function) – the function call session control function;
- HSS (Home Subscriber Server) – Server subscriber data;
- CSCF element is defined not as a physical device, and as a generalized function.

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SOFTWARE FOR THE AUTOMATED CALCULATION OF THE QUANTITATIVE CHARACTERISTICS OF NATURAL LANGUAGE TEXT DATA

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Quantitative linguistics is one of the areas of applied linguistics that studies language using statistical methods that can detect the language system properties and relationships of linguistic phenomena. The advantages of these methods is the accuracy and simplicity of the results obtained. There are a number of problems of language theory and computational linguistics that can be solved by subtracting the low-level quantitative characteristics of text.

In particular, the quantitative methods are widely used to address the definition of style and genre characteristics of texts and their classification.

The first attempts to apply quantitative methods of text processing were carried out in 1960, but due to the high complexity and the need for a huge amount of manual labor, researchers analyzed small texts (100 – 250 words). The development of computer technologies have increased the speed of parsing large amounts of data. It is allow to work with text in ways previously unavailable to scientists.

There are many software tools designed to help linguists to study patterns of language structure, but they are very scattered. Researchers still make some part of the work manually. For example, linguists should independently summarize the values obtained from parsers when they analyze the relations of the different quantitative features of texts. Thus, the development of software for the automated calculation of quantitative characteristics of natural text data is an actual problem whose solution will simplify and speed up the calculation of low-level quantitative indices.

The developed software can analyze text data and calculate 10 quantitative parameters:
– analyticity (aux/w, auxiliary words to all words in text ratio);
– verbality (v/w, verbs to all words ratio);
– substantivity (sb/w, substantives to all words ratio);
– adjectivity (adj/w, adjectives to all words ratio);
– pronominality (pn/w, pronouns to all words ratio);
– autosemanticity (aut/w, meaningful words to all words ratio);
– lexical diversity (lex/w, different lexemes to all words ratio);
– non-meaningfulness ((aux+pn)/w, non-meaningful words to all words ratio);
– nominativeness ((sb+adj)/w, substantives and adjectives to all words ratio),
– average word length.

The program implemented as a Windows Forms application, and it is written in C#. Some software modules for automated calculation of the quantitative characteristics of the text data, namely word processing modules are written used programming language Python, which is often used for tasks such as processing text files.

For morphological analysis of the words used third-party utilities: Mystem analyzer and Pymorphy library. The software calculates the quantitative indices depending on the user-selected analyzer.

Implemented system also provides the ability to generate reports for comparison of quantitative indices of different texts selected by the user.

Also the software allows the user to change the rules of calculation of existing quantitative parameters and create custom indices for further applications.

Within the report shows an analysis of natural language text data using quantitative methods.

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MODERN MEANS OF ACOUSTIC INTELLIGENCE

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The concept of acoustic intelligence can be considered as the process of obtaining information by receiving and analyzing the acoustic signals propagating in air from different objects. The primary sources of acoustic signals are mechanical oscillating systems, such as human speech organs, and the secondary – converters of various types, for example speakers. Acoustic Intelligence is carried by interception of industrial sounds of object and by interception of voice information through technical means, for example microphones.

In case if there is an open window in the room, can be used directional microphones for listening to the conversations. Intelligence can be carried from the neighboring buildings or cars that are close to that room. Basically there are three types of directional microphones, parabolic (reflex), tubular (interference) and flat microphone array.

Picture1 – Parabolic directional microphones

A parabolic microphone has a parabolic reflector, in focus of which the microphone capsules with non-directional or unidirectional characteristic of directivity is located. These microphones are sometimes called reflex. They have very different appearance (Picture 1). Sound waves reflect from the reflector and due to the properties of the parabola, after reflection, focus in the place where the microphone capsule is located. Coming at an angle to the axis of parabola waves are scattered by the reflector, without falling into the microphone.

Tubular microphone consists of a tube with holes and not directed or unidirectional microphone capsule which is located on the rear end of it. The main advantage of these microphones is that they are more compact than the parabolic ones. This allows you to use them when you need covert listening.

Flat directional microphones are represented by acoustic microphone array with integrated microphone capsules.The range of interception is 50-150 meters, with low noise levels can reach up to 500 m.
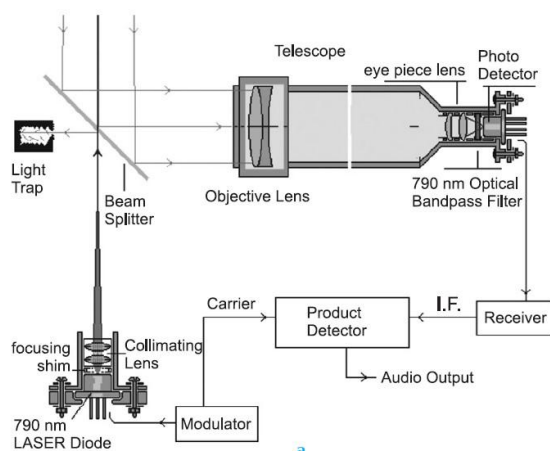
Picture 2 - LASI

Laser acoustic systems intelligence (LASI) are used in case when the windows in the room are closed, i.e. the applying of directional microphones is not possible. (Picture 2)For the realization of the covert work lasers have a wavelength of IR range (0.75 - 1.1 microns).

Acoustic intelligence systems are upgraded in order to increase abilities for the interception, but they have some disadvantages which are used by the defence side.

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COGNITIVE TECHNOLOGY
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Following the general euphoria on the field of nano-technology and a revolution in the production, which make 3d-printers, the world is beginning to move on to the next round of the technological revolution – cognitive technologies. While research is ongoing, specific technologies penetrate into the world. A simple example can be given to technologies that track eye movement. The tracking camera and special software allow to use a computer even paralyzed people. In a more sophisticated embodiment, such types of devices will be able to track the emotions on a face while somebody talking and analyzing what he saw, to inform about the true feelings of the speaker.

It is not surprise, that it has become a part of the marketer's sphere of interests. They do not need to wait for the Artificial Intelligence to start make a profit. Tracking the brain's response of the viewer to objects and elements of the plot in advertising, allow to make it bringing positive emotions more effective. By studying the brain's response to different machines, it is possible to sell exactly what people will be responding most strongly. Cognitive technologies may change a person, as its interaction with technology.

Cognitive Assistants – another possible breakthrough in technology. How do you know that the driver loses attention on the road? How do you know that the car runs by a drunk person or mentally inadequate driver? These adaptive support systems allow us to understand condition of the driver, and given the current development of automobile "autopilot", it will be possible not only to block the car, but also independently take the owner to the right place.

Interfaces like "brain-computer" is also gradually becoming a reality, threatening to leave behind usual keyboard, mouse, and touch panel. Robots can be trained to feel like people. The reverse case – transfer of images through the electrodes directly into the brain, avoiding the eye with optic nerve – will gain sight to many blind people. Similarly, you can create other senses, and it is not about restoring lost abilities, but their dramatic improvement, because the sensors can be more sensitive than the human senses.

In the near future we should expect many breakthroughs in this area, which can immediately noticeable change the market by providing new interfaces, intelligent computer systems and technologies, as well as to empower people. And, if you think about the recent performance of robotics and possibilities of three-dimensional printing, the synthesis of these technologies will be able to surprise even the science fiction writers.

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MPLS AND GMPLS TECHNOLOGIES IN COMPUTER NETWORKS

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With the implementation of the protocol MPLS (Multiprotocol Label Switching) providers got at their disposal the best performance of their networks and better control over them. At the same time, MPLS was limited in the providing bandwidth within the physical network. As a result of the development of DWDM (Dense Wavelength-division multiplexing) systems and optical switching providers got the opportunity to modify the capacity of this channel. MPLS does not depend on the characteristics of this type. That is why MPLS does not have any constructions which allow you to request additional amounts of bandwidth for the channel in those cases where it may be necessary for large customers such as an internet service provider.

GMPLS (Generalized Multi-Protocol Label Switching) extends MPLS protocol due to the inclusion of structures required to manage not only routers, but also the DWDM and ATM systems, optical cross-connects and other similar devices. With the GMPLS providers can dynamically allocate resources and provide the necessary redundancy to implement various methods of protection and recovery of the data.

It is important to bear in mind that the GMPLS, as MPLS, is not the network layer protocol. For example, TCP/IP network still requires a protocol IP to function. GMPLS is a signaling protocol which is used by the client equipment for signaling other equipment about necessity of establishing a connection or breaking chains. This is a significant difference from the modern networks where bandwidth must manually "fixed" by the network operator.

To escape the connection of the IP, GMPLS extends MPLS capabilities in a number of important areas. The changes affect the basic properties of the LSP (label-switched path), the procedures for requesting and transmitting tags, unidirectional type of LSP, propagation of errors and the information provided to synchronize the start and end LSR (label switching router) of the path.

While MPLS deals only with features, which is called packet switch capable (PSC) interfaces in GMPLS, in GMPLS four additional types of interfaces are introduced:
−   Layer-2 switch capable interfaces (L2SC) perform data transfer based on the contents of frames and cells.
−   Interfaces supporting TOM, or simply – TDM interfaces, perform data transfer based on the time slots.
−   Lambda switch capable interfaces (LSC), like the optical cross-connectors, work with individual wavelength channels or wavelength range.
−   Fiber switch capable interfaces (FSC) work with one or multiple fiber optic cables.

These devices establish LSP the same way as in MPLS. LSP can represent routed stream of IP-packets, but equally it could be another type of connection such as an optical path or SONET circuit. Do not forget that the path must begin and end on the devices of the same type. So, LSP, as a SONET channel, must begin and end on the SONET device.

All these different LSPs have nesting structure typical for MPLS. In MPLS flows are aggregated into larger flows. The same basic idea is used in the case with the only difference that now the LSP is a virtual representation of physical structures. For example, LSPs, as a lower level SONET channels can be nested together in a SONET channel of higher level.

In general GMPLS operates similar to MPLS. LSPs are set up using RSVP-TE (resource reservation protocol – traffic engineering) or CR-LDP (constraint-based routing label distribution protocol) for sending messages which is called path/label request message. This message contains generalized label request, often – the explicit route object (ERO), as well as some of the parameters that are specific to each type of technology. Generalized label request is an additional element of GMPLS which specifies the type of LSP encryption and LSP payload type. Encoding type indicates the type of appropriate technology, for example, SONET or Gigabit Ethernet. LSP payload type indicates the type of information transmitted in the payload data block composed of LSP. The path which is used by LSP in the network is controlled with ERO.

As in MPLS, a message arrives at the destination, sequentially passing through a number of nodes. The destination sends back the required tags which are inserted in the table of each LSR along the way. Once the response reaches the LER (Label Edge Router), that initiated a request, it becomes possible to establish LSP and forward traffic to the destination.

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COMPUTER VISION

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Robots − are autonomous devices that can act automatically. To carry out their functions, they need to interact with the environment, be able to change a position, and "to understand". Because of this, robots need to obtain visual information about the world. That means "to have a computer vision". Only after analyzing the data, they can act.

Computer vision is based on the information from the cameras. This may be a stereo camera, or multichamber system. Using a database of three-dimensional objects and textures allow to "see" what it was faced by robot. It measures the distance to the object "perceiving" the space and guided in it, allocates the obstacles in the area of movement. Vision helps the robot does not just work with objects and environment, but also to recognize the people, their faces and gestures, relying on special recognition program. These data, launch certain behavior patterns.

Remote control system (e.g, Webot or SAR-400), and robotics are not a "smart" computer vision. The last one, operates autonomously as possible, and not remotely controlled by the operator.

At the plants, for assembly the equipment is increasingly using a robotic systems. For example, Canon's endeavor to reduce human involvement in the assembly of cameras and optics at its plants in Japan. Robots that possessing computer vision can replace humans with heavy handling operations at the huge warehouses. By the other hand, it can also become a rival in a game of ping-pong. Simple and ordinary features like recalculation shop visitors or detection cars on the highway just can not be done without computer vision capabilities.

Computer vision gives an opportunity for robots to replace humans where it is needed: in aggressive environments, during the military operations, on the heavy work, at constant repetitive actions, where a man can make a mistake.

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QUALITY ASSURANCE IS NOT QUALITY CONTROL
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Nowadays popularity of programming is growing dramatically. Millions of programs are created every day. During this development specialists are facing errors, failures, or faults in their programs that cause them to get an incorrect or unexpected result. Those errors are called bugs. To prevent those bugs there is a special position in software development companies. These specialists are always connected with QA (Quality Assurance) and QC(Quality Control). A lot of people think that QA and QC means the same or are very similar. But it isn't right.

Quality Assurance is preventive process aimed to assure product quality in future. Quality Assurance is more oriented on process.

QA Mission – to guarantee:
- Implementation of all customer's requirements
- High quality of the product
- High-service quality
- Process effectiveness
- Quality Assurance of software development process

QA objective - to ensure, that optimal software development process established.

QA is obliged to control that:
- Standard process is inherited and adapted to project
- Project schedule is followed
- Regular and close communication with customer is established
- Project team is informed about all project changes

QA is obliged to:
- Raise all issues
- Obtain their resolving
- Analyze – how to optimize software development process (and obtain this optimization)
- Software and documentation Quality Assurance

QA objective – to ensure, that all requirements are implemented and that all requirements are implemented correctly!
- Requirements testing (completeness, correctness etc.)
- Software testing (GUI, Usability, Functional, Performance Testing etc.)
- Documentation testing

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— Regular reporting about software quality and issues

Quality Control is the process of finding errors in product, aimed on fixing these errors. Task of QC is real time product quality support.

Software Quality Control is limited to the Review/Testing phases of the Software Development Life Cycle and the goal is to ensure that the products meet specifications/requirements.

— Main activities of QC are:

— Reviews (Requirements, Code, Test Plan, Test Cases etc.)

— Testing (Unit, Integration, System, Acceptance)

— So, Quality Control is oriented on real time developed product.

Quality Assurance includes QC as well as other company quality improvement processes. Quality Assurance ensure that processes are set correctly ant result is predictable, but Quality Control ensures that product meet all requirements which was established by QA department.

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WIRELESS TECHNOLOGIES DEVELOPMENT

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The term "wireless" has been used to refer to radio communication in the broad sense of this word, i.e. in all cases where the transfer of information was carried out wirelessly. Later this interpretation has gone out of circulation, and the word "wireless" was used as the equivalent of the term "radio" or "radio frequency". Now these two notions are considered interchangeable in the case when it is mentioned about the range of frequency from 3 kHz to 300 GHz. However, the term "radio" is often used to describe the existing technologies (radio, satellite, radar, radio telephone communications, etc.). And the term "wireless" is usually referred to new radio technologies, such as PS and cellular telephony, paging, subscriber access, etc.
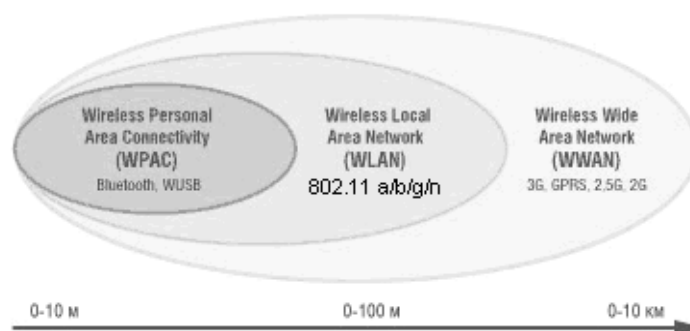
Figure 1.1 – The range of personal, local and global area wireless networks.

There are three types of wireless networks (Figure 1.1): WWAN (Wireless Wide Area Network), WLAN (Wireless Local Area Network) and WPAN (Wireless Personal Area Network).

While building WLAN, WPAN, and the systems of broad wireless access (BWA – Broadband Wireless Access) the similar techniques are used. The key difference between them (Fig. 1.2) is operating frequency and characteristics of radio interface. The WLAN and WPAN operate in unlicensed frequency spectrum of 2.4 and 5 GHz, i.e., they don't need frequency planning and coordination with other radio networks that operate in the same range. BWA (Broadband Wireless Access) are used as licensed and unlicensed spectrum (from 2 to 66 GHz) [1, 107].
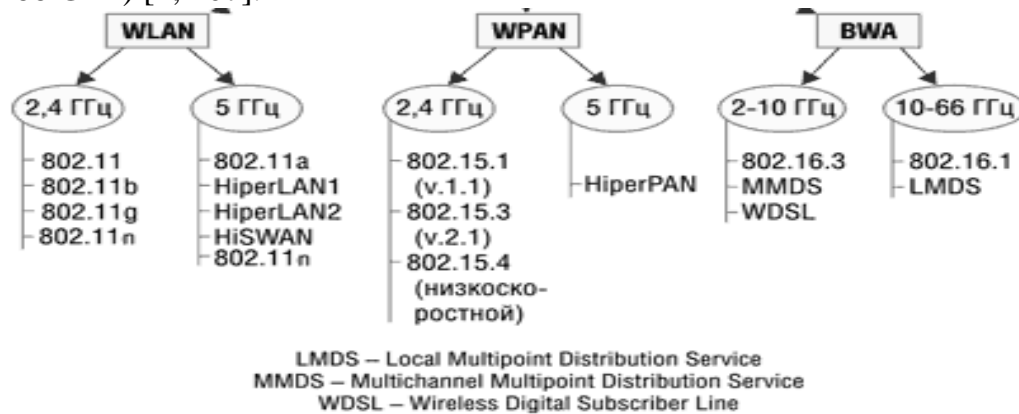
Figure 1.2 – Classification of Wireless Technologies

Thus, the main purpose of wireless local area networks (WLAN) – is an organization of access to information resources inside the house; the organization of commercial public access points (hot spots) in public places – hotels, airports, cafes, and the organization of temporary networks for some events (exhibitions, seminars). Wireless LANs are based on the IEEE 802.11 standards. These networks are also known as Wi-Fi (Wireless Fidelity). The brand Wi-Fi has received the world most widespread popularity.

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LOADING BALANCING ALGORITHMS IN CLOUD COMPUTING

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Cloud computing is based on Internet, which provides shared resources, such as software and information, to computers and other devices on-demand, like a public utility. As cloud computing is in its development state, so there are many problems in cloud computing Such as:

− Migrations on network level, so it requires minimum cost and time to move a job to some other unit
− Providing proper security to the data which is in transit or in storage
− Data availability issues in cloud

– Legal headache and trust issues
– Data origin and incidental disclosure of sensitive information could be possible.

Also, one of the most important problem in Cloud computing is the problem of load balancing. Far, while balancing the load, some types of information such as the number of workers, are waiting in queue, job arrival number, CPU processing number, so forth at each processor, as well as at neighboring processors, may be changed among the processors to increase performance capacity.

Load Balancing in Cloud Computing. Load balancing is definitely new method that gives an ability for resources and networks to provide a maximum throughput with minimum response. If you want to share the traffic between servers, your data can be sent and received without essence delay. There are several powerful algorithms that help traffic to be loaded between any numbers of available servers. A simple example of load balancing in our daily life can be related to websites. Without this thing, users could have big delays, timeouts and possible long system responses. Load balancing solutions usually apply excess servers which help a better providing of the communication traffic so that the website availability is finally resolved.

Algorithms in load balancing/ Static load balancing algorithm determines the node of cluster prior to calculating and remains unchanged throughout the computation, except in an emergency, such as a node failure. This method more consistent approach to the cloud of small cells due to the significant cost and duration of the migration of the virtual devices from one cell to another. Also, this type of balancing is easier to implement, and it is associated with less overhead.

The most famous technique that implements this approach – using circular DNS. Databases DNS-servers kept records define the mapping between host name and its IP-address. DNS technology allows you to make multiple entries in the database with the same domain name but different IP-addresses. Thus, you can specify multiple server platforms for a single application. In this case, the first user who requested this address will be sent to the first computer, the second – the second and so on. When the server used all records corresponding to one domain, it will return to the first address.

Dynamic algorithms for load balancing is based on the current state of the system and does not require pre-known information about the configuration of the system that allows you to instantly respond to changes in the system. Interaction between nodes during load balancing can be of two types – cooperative and non-cooperative.

In the first case the nodes working together to achieve a common goal – improving the complete response time of the system. In the second, each node operates independently and is trying to improve response times for tasks performed at this node. This types of algorithms characterized by a huge number of internal messages. This is because each server must receive information about the status of all neighboring nodes of the system and send information about themselves to other nodes. But the generation and receipt of the notification also needs to allocate CPU time and memory of the server which leads to an additional load on the whole system.

Conclusions. This paper describes different methods of load balancing on cloud servers such as static and dynamic. Discussed with the cloud computing requirements for security, trust issues, access control, sensitive information and data availability. This information might be useful in the research associated with load balancing in cloud computing.

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GROUND-PENETRATING RADAR
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Nowadays the analysis of ground surface and different objects under the ground is very important part in the field of science. We can use such methods to achieve different aims such as to analyze building bases, to find underground communication, to know where petrol leak can be.

Radar abbreviation means radio detection and ranging. Such acronym appeared in 1941. But the history of radar creation dated back to 1887, when German scientist Heinrich Rudolf Hertz started his experiments and discovered the existence of electromagnetic waves. In his work he focused on James Clerk Maxwell theory. Hertz explored how to catch and generate electromagnetic waves and found out that such waves were absorbed and reflected differently, depending on the material's object [2].

At first radio detection was used by militaries, to detect aircrafts and another moving aims. First successful detection of plane was performed in 1934. The plane was flying at a height of 150 meters and radar defined it at the distance of 600 meters.

Georadar (ground-penetrating radar) appeared after Antarctica relief mapping. Scientists used standard onboard locator situated on the plane. During experiment they found out on record two borders, the first was ground surface and the second – base of ice cover. So, they got the ability to evaluate the power of ice. Due to low absorption of electromagnetic waves in ice, the research of depth reached several hundred meters.

The operating principle is based on ultrabroadband impulse emission of electromagnetic waves that have meter or decimeter range. And signal is received from bound of different materials. Such materials have various electrophysical properties that give opportunity to know what exactly under the ground. As example, it can be contact between dry and wet soil, or between soil and artificial building base. Of course, we can research voids under the ground that also helps a lot.

There are several types of georadars. The first type is stroboscopic radar. Such radars emits low energy impulses, about 0.1-1 micro joules. But these impulses may emit

40-200 thousands per second. That gives high quality results and good precision. The main disadvantage of stroboscopic radars is restriction on depth, maximum 10 meters.

Low impulse radars emit 500-1000 impulses per second, with 100 micro joule power. The understanding of the radiogram requires special trained expert.

High power radars with separated antennas radiate only few impulses per second, but energy of such impulse is larger – 1-12 joules. So we can greatly increase signal to noise ratio. And we receive information from deep layers, up to kilometer depth. To process this radiogram we will need special software. Radar can't see 3 meter area from surface that is the biggest disadvantage [3].

It's possible to divide radars by ability to use one or several channels.

Single-channel devices have one receiver and one transmitter. Multichannel paired radars have several receiver-transmitter pairs and record from each channel simultaneously. We can say that actually multichannel georadar contains few single-channeled radars. The multichannel cost is disadvantage as well as their dimensions.

There are multichannel georadars with synthesized reception aperture. One of the most sophisticated types, where on one transmitting antenna few receiving antennae fall. That helps to position underground objects clearly. The minus is rather difficult processing of algorithms which must be solved in real time. And their price is also rather expensive [1].

Some ground radars can represent a sectional view of the subsurface. Different lines of collected data on one area may be used to construct three-dimensional images. Data may be presented as three-dimensional blocks, or lines of different direction.

As we can see, radio locating technologies have reached a high level. Using this technology building companies can perfectly calculate base of construction, geo engineers will be able to analyze ground easily and there are no problems to find natural resources.

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CYBERTERRORISM AS A NEW THREAT OF OUR TIME
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Nowadays the term "cyberterrorism" has become widely recognizable and often used. One study in November 2013, for example, revealed that 31,300 magazine and journal articles have now been written on the subject. This is prominence investigation, however, it has not lead into agreement about meaning of cyberterrorism, or how this term should be used.

I think the most accurate determination of cyber-terrorism is the using of computer LAN tools to shut down important infrastructures (such as energy, transportation, government operations) or to threaten and intimidate a government or civilian people. It can be done with a view to draw the Government's attention to specific problems, either for personal goals.

When people hear a word cyberterrorism the first thing that usually comes to one's mind is the thoughts of terrorist attacks or explosions or some type of physical activity that

victimizes or causes the death of innocent people. Cyberterrorism, however, is not usually intended for physical harm rather its intentions is to attack a network or computer or devices to gain access to confidential data or financial information. Some may think that Cyberterrorism and cyber attacks are the same but there's a big difference between the two. Cyberterrorism is an act of sabotage that is carried out to cause terror and loss of critical infrastructure.

Computers are used to store, processing, communicate information between groups and individuals. Computers are not the problem, though. It's the people who manipulate them for cyber attacks. These acts are carried out through the computer because it is cheap difficult to track and can affect large numbers of people. Furthermore that attack can be carried out from anywhere in the world. There are entire organizations or groups of hackers, which commit these acts to break into government databases for profit, fraud, disabling defence, blackmail, control of machinery, creation of social unrest and destruction and fear. There are numerous ways hackers can get into a system: through a virus, a Trojan horse, or even email. Wireless networks can be one of the biggest threats to the public because in this case you don't have to be physically connected to a computer to acquire its information.

People and important infrastructures are becoming more dependent on computers and information systems. This is a good environment for the development of cyberterrorism. By using vulnerabilities of computer systems terrorists could gain access to sensitive information, and even shut down critical functions, what can lead to tragedy.

There are two main trends of cyberterrorism attacks: The first type includes political acts aimed at the infliction of damage, which are very similar to acts of conventional terrorism. The second type is non-political actions which rely on information and communication technology, and are implemented by hackers, such as virus Dos&DDoS attacks. These attacks are carried with the purpose of get access to government and corporate systems to gain access to information.

Cyberterrorism has a very attractive option for terrorists. Since it can remain anonymous and has great potential to inflict massive damage. Also terrorist can be very far from the crime scene.

It is very important to identify differences between cyberterrorism and, so called, "hacktivism", a term invented by academics to determine the cooperation of political activism and hacking.

It is also important to bear in mind that cyber fears have been exaggerated. Cyber attacks on important components of the national infrastructure are not rare, but they were performed not by terrorists and did not attempt to inflict such damage to describe these acts as cyberterrorism.

Statistics at cyber attacks shows that Government structures and Industry are main targets for cyber criminals. Percent attacks on these sections are 22% and 23% respectively. Objectives of the Financial sector, in third place with 7 percent, next in the ranking attacks: News (6%) and Education (5%).

The threat of cyberterrorism is real. It cannot be denied and ignored, because it can lead to heavy consequences. A terrorist with a keyboard can be a lot more dangerous than a terrorist with a bomb. With the development of IT industry, this threat will grow. Considering this, it is important to develop more sophisticated security systems, especially in the sectors related to the safety of human life. Even though each year security systems are becoming safer and more complex, hackers and terrorists are also improve their skills and develop more complicated hacking tools.

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SELECTING A PORTAL TECHNOLOGY PLATFORM
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The modern means of search and description of information don't meet the increasing needs of users. Their development concerning the increase of efficiency of information search and simplification of user interaction is required.

The possible solution to this problem is to create technical and information means of description of the sense of available information with possibility of further intelligent search in an array of text information.

Knowledge enterprise portal is an instrument to control intellectual property. It can be (different) either information or data. The portal brings a large number of different separate information and organizes it, categorizes and personalizes to present it to us in the right form at the right time and in the right place.

Nowadays there are huge amounts of platforms for developing knowledge portals, such as: ***Drupal, PHP-NUKE, IBM WEBSPHERE PORTAL, SHAREPOINT PORTAL, Sun ONE Portal.*** Many of them have a number of deficiencies, such as high hardware requirements, low productivity, etc.

As a result of the existing portal platforms analysis, choice was made in favor of the SHAREPOINT PORTAL for the following reasons.

Using SHAREPOINT PORTAL allows deploying information portals to ensure effective interaction of users and workgroups to share data. The portal facilitates collaboration by combining, the organization and data retrieval.

SHAREPOINT PORTAL Server has the following characteristics:
− built on the basis of Microsoft Web Storage System and Publishing and Knowledge Management Collaboration Data Objects (PKMCDO) object models that provide the power necessary for the control and document storage in a large corporate intranet;
− implements the architecture Digital Dashboard;
− functions of indexing, searching and retrieval can be caused by ADO or through WebDAV / XMLHTTP requests;
− provides a rich set of services, such as: the mechanism of conducting discussions, attachments to the document, folder, or an entire category of documents; announcements and the query language system based on subscriptions and notifications.

The main features of SharePoint Portal are:
− Full functionality of a portal directly after installation;
− High-speed performance, scalability and deployment of web forms;

− Integration with business applications;
− Flexibility, personalization and adaptability of web, of components and pages on its basis;
− Subject sections;
− Search.

The SharePoint Portal Server offers the flexible means of deployment providing the distributed structure and optimum operation of a portal such as creation of servers with the distributed servers of jobs, servers of databases, search capabilities indexing and different external services, ability to service one million users.

SharePoint Portal Server contains possibility of subject sorting which helps intuitively navigate in a review of arbitrary data, from documents and data on people to nodes based on Windows SharePoint Services.

SharePoint has a well-integrated search experience for both traditional website and document content. Allows users to search for keywords in the full text and document properties. Users can search not only information but also other people, working groups and portal sites.

In conclusion, based on these advantages it is possible to tell that the SharePoint platform is one of the best portals of knowledge for creation.

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WHY WE CREATE INTELLIGENT MACHINES AND WHY WE FAIL
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A most of people had heard about artificial intelligence, but not every of them knows exactly what purpose of creating computer smarter than us. There's many books were written about war with evil robots and little of them – about our dark future without them.

However we still reproduce ourselves exponentially fast and our intellectual growth doesn't keep up with our population. Humanity survived six ages of greatest economic fall deeply connected to resources deficit. Last of them called "Coal crisis" had ended with 19th century and lead to revolution in science and technology and unfortunately to ruinous world wars that continue till now. Next crisis goes to be fatal for global civilization we built.

Our only chance to survive hard times is to begin next science revolution before them. Then, according to Moore's law, process of mind's evolution will end in event called "Technological singularity". And human's biological brain just not capable to comprehend rules of future's world. So we must evolve, and quickly. Computer is perfect place for saving our experience in living. Also artificial intelligence itself can solve hardest of our problems, and even prevent crisis. Or provoke it instead. No one knows so far.

But crossing human's brain and computer – difficult task. Nowadays scientists use two approaches for this problem. First uses computer's formal logic to describe process of

thinking and second is trying to build computer network similar to neuronet in our head structurally. Trouble is in fact that our brain doesn't use formal logic, and can't be controlled effectively. And nobody wants to create totally uncontrolled supermind.

First of all, without extremely complex control system any brain cannot learn and therefore think at all. Nature has created such a system after millions of years. It works by electro-chemical reactions that we even can't model completely. Now we call it emotions. But it's impossible to program without defining clear goal of thinking.

Some philosophers say that we need to find meaning of our own life to find such a goal for artificial one. After that they say that questions like this has no answer at all. But eventually, somehow we exist, live and think. So problem may be solved. We just need to find another approach to it.

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QR CODE RECOGNITION
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QR code (the English – quick response) – is a matrix code (dimensional barcode), designed and presented by the Japanese company "Denso-Wave" in 1994 and intended to encode small pieces of information in a graphical image, has mostly found a use in mobile devices. The code can contain the address of the web resource, ordinary text, GPS coordinates or a contact.

QR-codes are protected from improper data reading – a code can be damaged or a bad picture comes from the scanner camera.

Protection is achieved by using special codes that can correct errors during the process of reading (they are called the Reed-Solomon codes). Correcting codes of Reed-Solomon (RS) are recorded after all the actual information data. The major part of the QR-matrix is mainly occupied by RS-codes.

The process of QR-codes recognition can be divided into the following:

1) Code detection
2) Reading of 5 bits of system information
3) System information mask overlaying
4) Data headline reading
5) The mask applying to the title
6) Data and correcting codes reading

Let us consider in detail the particular steps of reading the code on the example of the code, which contains a ciphered number "5".

1. Code detection.

3 large squares are used to detect a QR code. These data do not contain any information load in terms of encoded information. All the other fields of the code contain useful information. It can be divided into two parts: system information and data.

System information is duplicated, which allows to reduce the probability of errors rise during the process of the code detecting and reading. System Information is 15 bit data, including the first 5 bits of useful information and the remaining 10 bits of a BCH code that enables to correct errors in the system data. The class of BCH codes includes RS codes.

2. Reading of 5 bits of system information.

The first 5 bits of data contain the information, which is useful for us. 2 of them indicate the level of error correction, and the other 3 bits shows which mask (out of 8 available) is applied to the data.

3. System information mask overlaying.

The static mask, which is applied to any system information, is used besides the described protection schemes. It looks like 101010000010010. We are only interested in the first 5 bits: 10101. After applying the xor operation we get the level of error correction.

4. Data headline reading.

The 4 bit headline contains information on the mode, it tells us, with what data we will be working. Reading starts from the lower right corner and goes on in the serpentine shape.

5. The mask applying to the title.

After reading of the 4 bits that describe mode, it is necessary to apply a mask to them.

Mask is chosen according to the meaning. When it comes to TRUE for a bit with the coordinates (i, j), the bit is inverted. Otherwise it remains unchanged. The coordinates start from the upper left corner (0,0).

As a result of xor operation for the mode (0111) and mask indicator (0110) we get the encoding code mode (0001 – numerical mode).

6. Data and correcting codes reading.

Having the information about the mode, it's possible to start reading the information.

The first block after the mode indicator is the number of characters. For numerical mode the number is encoded in the next 10 bits and for the 8-bit mode – in 8 bits.

00 01 10 00 00 11 01 01 10 00

00 01 10 00 01 10 00 01 10 00

_____

| 00 | 00 | 00 | 00 | 01 | 01 | 01 | 00 | 00 | 00 |

The first part: 00 00 00 00 01 = 1 package

The second part: 01 01 00 00 00 = "5"

The analysis of the QR-codes structure and the given example show that numeric QR-code types can be recognized without a scanner easily. Alphanumeric codes have very similar structure, that's why they also will not create problems.

But there are code modes that use more complicated structure of information location, which makes the code recognition procedure without a special device inexpedient.

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INSIDE GOOGLE TRANSLATE

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Everyone knows that Google is an author of the most popular translator in the world. But only small amount of them know how it really works. First of all, Google translator is an automatic translation tool that is not like the other. The software for Google Translator

was originally created in the 1980s by researchers at IBM. Comparing to others it is not based on the intellectual presuppositions, but it is designed so that is extracts the meaning of an expression from its syntax vocabulary. Moreover, it does not deal with meanings at all.

The Google Translate or shortly GT uses a method of translating, which is rely on so-called distributed representation. The method states that it is possible to analyze the entries, which are missing from the dictionary, using distributed representation of every word and even phrase. The implementation of the above was achieved by learning a linear projection between each language vector space.

The method has two steps:
1. To build monolingual model for every language using big amount of text
2. To use a small bilingual dictionary to achieve learning a linear projection between languages.

For representation the language, Skip-gram or Continuous Bag-of-Words (CBOW) is used. The reason why this is used is that the representations of similar words has a small distance in the vector space. This makes, firstly easier generalization to novel patterns, secondly more robust model estimation.

On the figure 1, you can see simple visualization, which illustrates the basics of Google methods work-flow. On this figure, there are visualized the vectors for numbers and animals in two languages: English and Spanish. As you can see, these concepts have similar geometric arrangements.
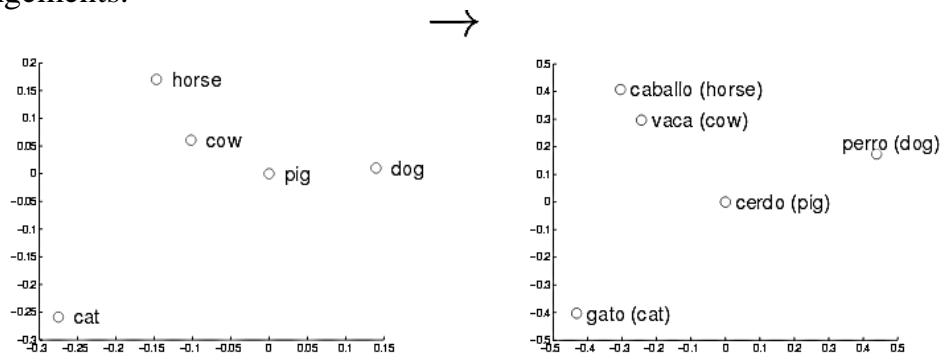
It is shown that many linguistic regularities are captured by the distributed representations of words, and that it is possible to express many of those similarities among words as linear translations. Let us say we have vector operation "queen" − "woman" + "man" result is close to king.

Talking formally, for given sequence of training words $w_1, w_2, ..., w_T$ .., the Skip-gram models are used to maximize the average log probability $\frac{1}{T} \sum_{t=1}^{T} \left[\sum_{j=-k}^{k} \log p(w_{t+j} \mid w_t) \right]$, where k is the training window size (which possibly can be a function of the center word w). Every word w is associated with so-called two learnable parameter vectors, in the skip-gram model.

The both (Continuous Bag-of-Words and Skip-gram) models are tested using stochastic gradient descent. This method also call like backpropagation rule, that was learned in 1986. When trained on a large dataset, these models capture substantial amount of semantic information. As mentioned before, closely related words have similar vector representations, e.g., school and university, lake and river. This is because school and university appear in similar contexts, so that during training the vector representations of these words are pushed to be close to each other.

It is interesting, that the relationships between concepts are captured via linear operations. For instance, vector (Ukraine) – vector (Kyiv) is similar to vector (Spanish) – vector (Madrid) or vector(France) – vector(Paris)

The vector representations of words, which are similar in different languages, are related by a linear transformation. For example, Figure 1 that word vectors for Spanish animals (gato, cerdo) and for the corresponding English animals (cat, pig) have almost the same geometric arrangements. As well, linear mapping (a rotation and scaling, namely) can capture the relationship, which exists between vector spaces, that represent these languages.

Considering above, i can say that Google can translate even the other animals to Spanish, if it knows the translation of ping and cat from English to Spanish. In that case, it can learn the transformation matrix, which is the key.

To summary, I can say that this paper demonstrated possibilities, which distributed representations give for machine translation. Such algorithms can work well, because they don't require a large starting dictionary. The main thing that that need is large amount of monolingual data. It can be different poems and novels. The next feature is the Google Translate can works well with not so close to each other languages, like Chinese and Ukrainian.

The research created by Google is the good experience. And in nearly feature it can be used for improving existing dictionaries.

And the last point is since the translations are done by computers, not all the results will be perfect. If the more and more people will be improve the translations of documents generated by Google, the quality of translate will be better.

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USING COMBINED MODULATION METHOD IN MICROWAVE COMMUNICATION DATA TRANSFERRING SYSTEMS

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The combined modulation, which includes M-fold quadrature modulation (QAM) as a primary modulation and frequency modulation (FM) as a secondary one, is successfully used for transmitting digital TV signals on existing radiorelay communication lines which were previously intended to transmit one analog TV channel with frequency modulation.

The main functions of modern telecommunications data transferring systems are:

1. Transmission of signals multi-channel digital TV.

2. Exchange of high-speed digital data (Internet, VoIP, etc) with a large number of subscribers.

3. Exchange of high-speed digital data over dedicated channels.

This accumulation of simultaneously implemented functions, each of which requires substantial radio frequency bands, has led to the need to find ways to increase the spectral efficiency.

The obvious way to increase the spectral efficiency is to use higher-level modulations. However, this solution leads to the loss of power efficiency in data transferring systems. It isn't the only trouble. When high-level modulation is used, there are also many additional requirements to quality of the transmission channel, as well as to the transmitting and receiving equipment.

The more complex modulation, the more it is exposed to effects of "multipath propagation mode". Since the frequency resource of up to 10 GHz inclusive is almost completely exhausted, so the views of developers of multimedia systems are focused on the frequency bands above 10 GHz. It can be argued that the use of the multicarrier mode OFDM (Orthogonal frequency division multiplexing) relatively bands above 10 GHz has no significant advantages compared to the use of only one carrier that is connected with peculiarities of the mode propagation of radio signals in different frequency ranges.

Overcoming all these disadvantages is possible due to the use of combined modulation of M-QAM/FM.

Let us compare the parameters of the combined modulator M-QAM/FM with parameters of the conventional frequency modulator and QPSK modulator provided equal bandwidth. For modulation such as 64-QAM at fixed symbol rate of 6,952 Msymb/s, bit rate is equal to 41,71 Mbit/s. At this speed of the transport stream can be transmitted up to 8 digital television channels from the MPEG-2 compression. Transmission channel with a combined modulation 64-QAM/FM will occupy the 20MHz bandwidth. Thus, the spectral efficiency for this technology will be 41,71Mbit/s: 20MHz = 2,08 bit/s/Hz. This is more than twice as little as for the original modulation 64-QAM (an average of 4,8 bit/s/Hz), but it is 1,5-2 times larger than for those modulations that have approximately the same power in the radio channel as QPSK or FSK.

Figure 1(a) shows the spectral efficiency of telecommunication systems using different types of digital modulation.
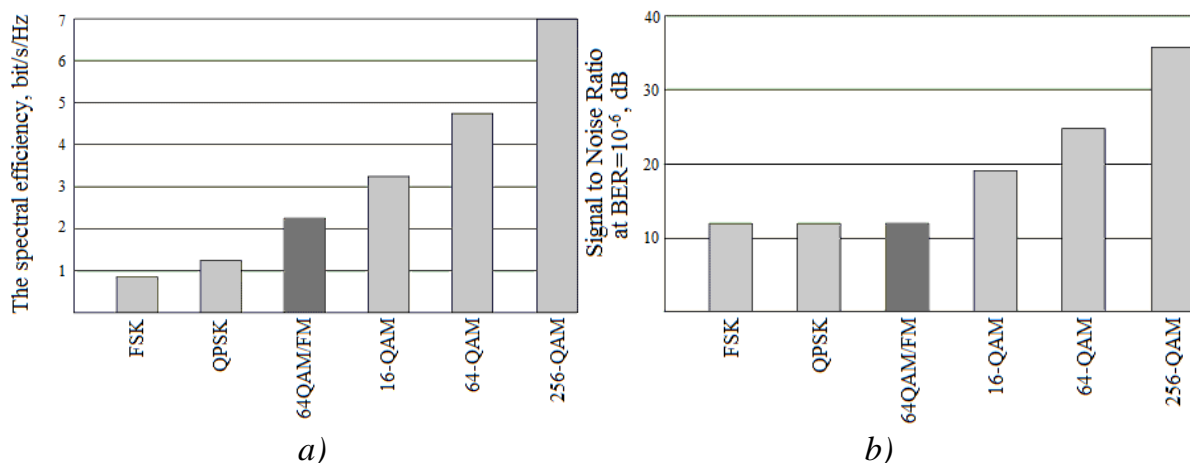
Figure 1. Comparison of the spectral (a) and energy (b) characteristics of the systems used by the different types of digital modulation

The energy efficiency of the system is determined by the threshold signal/noise ratio, which must be reached to obtain the desired BER before the demodulator (*Figure 1(b)*). For systems that use 64-QAM modulation, the threshold signal/noise ratio is equal at least

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25dB, even with the gain of immunity encoding, and for systems with 16-QAM modulation threshold value is 19dB. The data obtained during the experimental operation of devices using combined modulation, which is also confirmed by the technical references, give reasons to assert that the combined modulation requires a signal/noise ratio only 10-12dB that is approximately the same value as that for conventional frequency modulation. But at the same time spectral efficiency of the system with the modulation even 64-QAM/FM is twice as much as the spectral efficiency not only for the FSK, but also for QPSK. Using the 256-QAM/FM modulation this excess amount is three times more.

Using combined modulation M-QAM/FM for modernization of existing broadcasting systems as well as for construction of new interactive multimedia systems can achieve great advantages not only in potential transmission of digital signals with complex types of modulation through the channels intended only to transmit analog signals, but also in significant increase of spectral and power efficiency systems that operate at frequencies above 10 GHz.

Application of combined modulation for creating telecommunications networks is a highly effective advanced solution that can bring quality reliable telecommunications services to the mass market and meets the high requirements of resource conservation and environmental safety.

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HOME AUTOMATION

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We have been hearing talks about "internet of things" for almost 15 years now. But are we really close already? Home automation is the new field in house designing that uses the new technologies and embraces concept of "internet of things" to make people's life easier. All these houses need to be called "smart" are special sensors and central computer to make all decisions about how to react. These sensors have to be aware of what is happening inside the house. Possible reactions contain: opening/closing doors/windows, turning on and off lights and water, changing home temperature, making morning coffee and calling owner when security alarm is triggered.

Many big companies already have created smart home controlled devices, for example Samsung's smart refrigerators, dishwashers and washing machines, Phillips' wireless lighting bulbs and many other smart TVs, conditioning systems, music systems, etc.

Also many other separate companies tried to make different parts of smart house but only few of them can actually work together. Market still doesn't have any solid package of working parts that can be used together without difficulties. Because of that the most popular way to make your home automated – is to make it all yourself.

All separate components have they own API (application programming interface) – the way you can communicate and control them. Second part of creating own "smart house" is to use that API and separate computer as main system's brain to control other house's systems as peripheral. Any embedded system can be used for that, from Arduino system to Raspberry Pi.

Another good idea is to make smart house cloud controlled. It can be achieved using special triggering service like IFTTT (IF This Then That). Then all you need to be worried about is establishing connecting from local peripheral devices to the cloud system.

In general tech industry is going towards such concepts. In the nearest future we're going to see more smart devices, wearable electronics and feel integration tech in our live.

KNOWLEDGE EXTRACTION IN NATURAL LANGUAGE PROCESSING
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Nowadays there is still actual problem of storage and manipulation of big data arrays of natural texts. It is related to the computer technologies evolution and accumulation of the information which is hard to process by computer tools because it is non-formalized. Though there is a hot necessity of making natural data to be more accessible for computer.

The researches and works related to the problem of texts understanding by a computer are made under computer science section called Natural Language Processing (NLP). NLP is closely related to linguistics as it is studying the specificity of natural languages and has common problems such as text formalization, translations from one language into another, etc. Except the purely linguistic problems, NLP works on extraction of useful information and related facts from text corpora, natural language understanding by computer, computer text generation, computer "question-answer" systems and many adjacent tasks. The most important and the most complex of the problems above in NLP is the problem of language understanding by computer and all methods of mental processes modelling by computer did not give the expected results. Text understanding by the computer is a member of the class of problems termed AI-complete and it means that it is necessary to create the artificial intelligence to solve this problem completely, which is not possible on present level of science. There are a plenty of algorithms and approaches developed to solve these problem partly, such as statistical algorithms, neural networks, semantic networks. Methods are improving all the time and looking for new ways of NLP problems solving.

Knowledge extraction is the creation of knowledge from structured and unstructured sources. There are a lot of methods and approaches for knowledge extraction but all of them have common steps: morphological text analysis and splitting text into words and sentences, syntax analysis of sentences and groups of sentences and semantic analysis. All this steps extract features of input text corpora and in synthesis with statistical methods provides a basis for further processing. In this study, we offer the use of ontologies for knowledge extraction and structuring. In computer and information science ontology is a formal framework that names and defines the concepts, their attributes and interrelationships between entities in a domain of disclosure. Ontologies are the logical evolution of semantic networks that are widely used in common NLP methods. Ontologies are the graphs that allows to store and handle data in computer-readable format and can be applied to problems of machine translation from one natural language to another, data interpretation with computer, factual analysis, knowledge management systems and etc.

In this paper we described me most important problems of NLP and the most popular methods of their solving and offered a method of knowledge extraction from natural language texts based on using of ontologies. One future direction is the automatization of the process of creating ontologies.

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