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About Computer Society of India

The seed for the Computer Society of India (CSI) was first shown in the year 1965 with a handful of IT enthusiasts who were a computer user group and felt the need to organize their activities. They also wanted to share their knowledge and exchange ideas on what they felt was a fast emerging sector. Today the CSI takes pride in being the largest and most professionally managed association of and for IT professionals in India. The purposes of the Society are scientific and educational directed towards the advancement of the theory and practice of computer science and IT. The organisation has grown to an enviable size of 100,000 strong members consisting of professionals with varied backgrounds including Software developers, Scientists, Academicians, Project Managers, CIO's , CTO's & IT vendors to just name a few. It has spread its branches all over the country. Currently having more than 500 student branches and rooted firmly at 73 different locations, CSI has plans of opening many more chapters & activity centres in smaller towns and cities of the country. The idea is to spread the knowledge, and provide opportunities to as many interested as possible.

The CSI Vision: "IT for Masses"

Keeping in mind the interest of the IT professionals & computer users CSI works towards making the profession an area of choice amongst all sections of the society. The promotion of Information Technology as a profession is the top priority of CSI today. To fulfill this objective, the CSI regularly organizes conferences, conventions, lectures, projects, awards. And at the same time it also ensures that regular training and skill updating are organized for the IT professionals. Education Directorate. CSI also works towards a global approach, by seeking out alliances with organizations overseas who may be willing to come forward and participate in such activities. CSI also helps governments in formulating IT strategy & planning.

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Contemporary Betterment of Wireless Sensor Networks in Various Fields – A Review

L.Karthikeyan, Nisha.M, Nithesh Rajan. T. K, Peratchi Suja.R

Abstract

Wireless Sensor Network is a spatially dispersed sensors for monitoring and recording environmental conditions with its physical changes or development and stores the data in an organised manner. Wireless sensor network plays a major role in military applications, health applications and industrial applications and so on. Presently Wireless sensor network faces controversy and challenges regarding increased energy consumption, data processing, quality of services and bandwidth demand. Over the past few years, research community provided various methodologies to get on top of these issues and objections. In this paper a study of Wireless sensor network regarding its application is conducted. They are compared with procurable methodologies which pays a way to bring an advanced research in wireless sensor network.

Keywords: Wireless Sensor Networks, Sensors, Data Rate, Bandwidth.

Introduction:

In the recent years on the field of sensors, the real time applications play a spectacular attention among techno-expert and researchers. The sending and receiving message techniques utilizes propagation of sound (i.e. wireless) in surrounding known as wireless communication, in which the use of sensors in such communication is known as wireless sensor communication. Sensors are capable of sensing an object and communicating signals to compute data. Signal transmission occurs between source node to destination node through the intermediate node. An operator, wireless communication antenna, limited memory, and a battery-operated device are provided to construct a sensor node. Detection and measurement of chemical, biological and explosive vapour including people can be achieved through sensors. As reported on "TIMES OF INDIA" on 24th September 2019 in Chandigarh the thermal imagery of an elephant is detected accurately by sensor when it approaches the railway track.

Related works:

UWSNs uses various vehicles and sensors to collect data and to monitor their activities. Some of the issues in these techniques are propagation delay, limited bandwidth, 3D topology, routing, media access control, resource utilization and power constraints [1]. The field of telemedicine WSNs play an important role for supervising patients at any place. In order to scale down the patient's distress, strengthen mobility, lessen cost WSNs is used. Ambient Assisted Living (AAL) are bespoke to users

demands, information gathering and moving about the patient to prepare personalized feedback [2]. The energy harvesting in wireless sensor network have gained consideration due to their universal nature and their expanded distribution in various fields like Internet of things (IOT), Cyber security and some systems. There is congestion in the WSNs technology due to narrow sources [3]. WSNs are capable of noticing the temperature and provide data. The sensors can detect both chemical parameters (carbon monoxide, carbon dioxide, nitrogen dioxide) and physical parameters (temperature, humidity and pressure). The sensors in the WSNs would help in forest fire detection [4]. The challenging fields (landslide detection) in the wireless sensor networks available in the field of geophysical researches. It uses the collection of networks. The network is composed of wi-fi, wireless sensor nodes and satellite terminals for dynamic delivery of data in data management centre. The centre is furnished with software and hardware for data analysis [5]. The WSNs helps in monitoring the water quality. Electrochemical sensors were used to supervise water quality and then the report will be displayed in the web using GSM and WSN technology. The sensors are approved in classic laboratories. It was also mentioned that the sensors would give update instantly when the quality differs from previous analysis [6]. The Air pollution monitoring is a serious issue that has been increasing day by day in recent days. Conventional air pollution systems which was used in earlier days are not able to give high spatiotemporal resolution data due to non-scalability and narrow availability of data. WSN used to improve the quality of monitoring the air. The sensors available in the WSNs detect the physical and chemical parameters in the system [7]. The control and monitoring of electrical appliances by the wireless sensor network. The devices used for this network are wi-fi, Bluetooth, and ZigBee. The automation system helps in controlling the light, temperature, ventilation and air conditioning. Home automation is possible to be made in multi-story building environment [8].

Materials and Methods:

 In this section, many applications of wireless sensor networks have been discussed.

Military applications:

Wireless sensor networks can improvise the response to asymmetric threats and system architecture based on commercial-off-the-shelf technology for military operations. In the bastion, the utilization of wireless sensor networks helps to reduce the uncertainty over the enemy forces. [12] Military applications like controlling belligerent activities in surroundings and to safe guard soldiers using wireless sensor network. The more prominent work of wireless network is to detect the enemy movement and to track the force. Deployment of soldiers in war would be easy with sensor nodes, which is transported to area of deployment by vehicle. On the other hand, sensors and cameras are fitted to the vehicle and then the vehicle sends the data to the control station.[13] The control station receives the data; accordingly, troops are set for the war. This helps in identifying the enemies troop formation that makes the war easier.

Health applications:

The biosensor usage is connected to body sensor system functions as a person utilize biosensor to capture information, while performing their regular actions like jogging or workout. On further improvement designers and revitalising staff are finding improvised approaches to assemble significant information about location in a customised manner. Provided information are utilized for

research purpose and on locational medicinal choice. Biomedical smart sensors are only in baseline. Currently WSN focuses on detecting heart problems in advance and the doctors are intimated to initiate the post-work to reduce the risk of a person. The treatment can also be digitalized in advanced stage of health care application using WSN. Similarly, content/level of glucose is monitored continuously for surpassing emerging disease called diabetes and its indispensable treatment includes exercise, insulin injections, strict diet and blood monitoring. [13] Biomedical sensors can be used as effective and convincing way to treat diabetes.

Latest development of application on health care using WSN.

A wireless infrastructure called CODEBLUE, is intended for the distribution of forces in preparation of equipment or devices for the treatments to be given in emergency medical care, wireless vital sign sensors and personal digital assistants (PDAs). The first responder ability is enhanced so that it gathers information about a patient like their current location, personal and medical details. It ensures a coherent transfer of data to the healthcare personnel to make the necessary facilities in the hospital to provide treatment. In fig 1, Health Application model is clearly shown.

SMART Technology (Scalable Medical Alert Response Technology) is a patient tracking system which uses WSN and it continuously monitors the activity of a person during normal and abnormal behaviour regarding one's health. This system transfers the accumulated data between external sites, as well as within a healthcare facility.
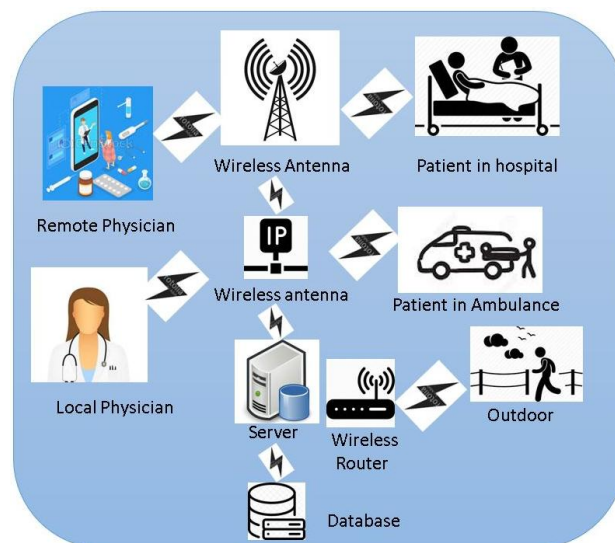

Fig. 1. Health Application Model.

Smart Grids Using Wireless Sensor Network:

The latest development in embedded systems and wireless sensor networks (WSN) helps the smart grid system for the low-cost monitoring and automation system. Smart grid is the digital technology that monitors the electrical device installed in the various buildings using smart devices. The ultimate aim of the smart grid is to boost the fault detection and to heal that fault without the technician's aid, smart grids conventional electrical networks can be improved. Smart grid uses WSN

for control, measurement, monitoring and fault investigation at the low cost.[16] The components of sensor nodes are sensors, transceiver, processor, actuator and memory. Sensor diagnoses distinct parameters like temperature, power supply, humidity, etc. The nodes of WSN are mechanised using batteries. Data recovery, computerized monitoring, blooming communication technologies are some of the striking specifications of smart grid. [17] The categorization of smart grid communication networks are Wide Area Network, Neighbourhood Area Network and Home Area Network based on the work they perform on the different stages of communication technology.

Home Area Network

The automation system for residence uses this type of network. It consist of electrical appliances and wireless sensor networks. It consist of one central power grid to monitor and give commands to the devices. The electrical appliances used in home works according to the orders given by the central power grid. They have a very few meters of coverage area.

Neighborhood Area Network

The aim of this network is to establish communication between the central controller and the smart meters which gather information. Smart meters are associated with various gateways over NANs. This network has about 1–10 square miles of coverage. The data rate for Neighbourhood Area Network is around 10 Kbps–1000 Kbps.

Wide Area Network

The Wide Area Network is used to connect various Neighborhood Area Network(NAN). To collect the data from NANs various data collection points were setted and these data were transferred to intermediate controller. The data requirement rate for WAN is around 10 - 100 Mbps. WAN is appropriate for Supervisory Control and Data Acquisition (SCADA) systems for examining, data accession, superintendence of power grid.

Industrial applications:

Wireless sensor networks in industries are very essential, they are forecast to upturn by 60 % in the next few years. Timely growth in wireless communication, efficiency of power drives and feasible wireless sensor network requirement in industrial application.[3] Wireless proficiency provides tremendous gain for industrial applications. Remote sensor installation instead of laying cables outgrowth in preserving labour cost, materials and power. The protocols and operating frequencies in industrial applications are mentioned elaborately in Table.1. The cruel environmental circumstances of industries may cause a part sensor to flaw. In such position sensors may be subject to vibrations, high humidity levels, radio frequency interference, dirt and dust.

The important procedure that has to be taken into attention in the industrial WSN is routing. As a consequence, IWSN routing protocol promotes sensor constraints along with transmission of data and to come up with accuracy. since this can impact the delivery rates of packet, the end-to-end packet delays and lifetime of the network. Protocols and operating frequency in industrial application:

Table: 1 Protocols and Operating Frequency.

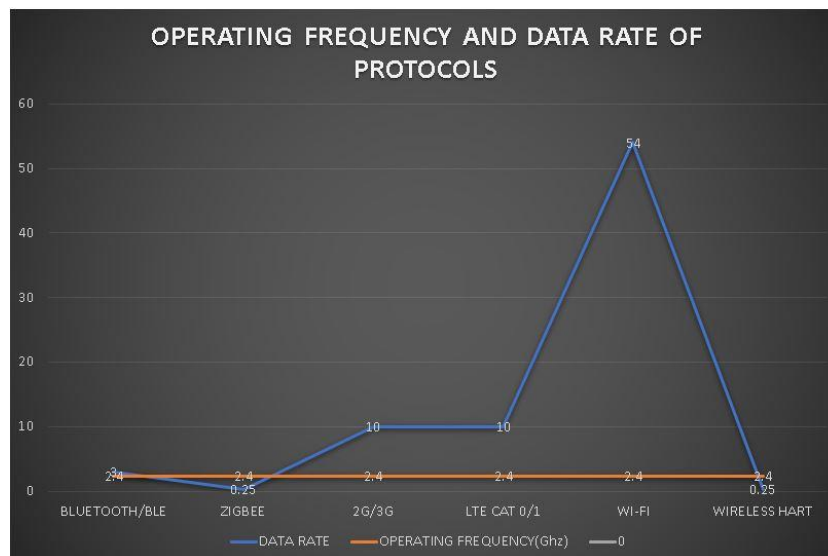| S.N.	PROTOCOL	OPERATING FREQUENCY	DATA RATE	COST
1	Bluetooth/BLE	Band 2.4 GHz	1,2,3 Mbps	Low
2	Zigbee	Band 2.4GHz and 900 MHz	250 Kbps	Moderate
2	2G/3G	Cellular band	10 Mbps	High
4	LTE Cat 0/1	Cellular band	1-10 Mbps	High
5	Wi-fi	2.4 GHz	0.1-54 Mbps	Low
6	Wireless HART	Band 2.4 GHz	250 Kbps	Moderate

Fig. 2. Operating Frequency and Data Rate of Protocols.

Discussion:

This paper had given an overview about the application of wireless sensor networks in various fields like military, industrial and health application. Thus, these various application helps in improving the security of people and reduce the work of man power in highly efficient manner. In industrial application, the data rate of 3G protocol is 10 Mbps whereas for Bluetooth/BLE is 1-3 Mbps and further development of technologies increases the data rate. The only disadvantage is limited computation and communication resources. This field will get further improvised in the future also its existence and usage will be incredibly increased.

Conclusion:

This paper aims at giving an overview of the applications in WSN with which the researchers will find beneficial in understanding the facilities of WSN and further optimizations can be performed to improve the performance of the WSN. Thus, Detection and measurement of chemical, biological and explosive vapour including people can be achieved through wireless sensor networks.

REFERENCES:

1. Gkikopouli, G.N.,Manesis,S.: "A Survey on Underwater Wireless Sensor Network and Applications". In: 20th Mediterranean conference on control and automation (2012)

2. Enrique, D.Z., Luis, F.Z., AnaVerónica, M.R., Isabel, G.G.: "Wireless Sensor Networks In Health Application". In: Annual International Conference of the IEEE Engineering in Medicine and Biology Society (2011)

3. Kamarul, Z.P., Kamilia, K., SyaAzmeela, S., SitiSophiayati, Y.: "Energy harvesting in Wireless Sensor Network". In: 3rd International Symposium on Telecommunication Technologies (ISTT)(2017)

4. Li Guang-Hui, Zhao Jun, Wangzhi.: "Research on Forest Fire detection based on Wireless Sensor Network". In:6th world congress on Intelligent control and automation(2006)

5. Andrea, G., Matteo Lucchi, Emanuele Tavelli, Marco Barla, Giovanni Gigli, Nicola casagli, Marco Chiani, Davide Dardari.: "A Robust Wireless Sensor Network for landslide risk analysis". In: IEEE sensors journal (2016)

6. Prasad, M.P., Harish, H.K., Kalkari, U.P.: "Wireless Sensor Network based water monitoring systems". In: 2nd International conference on Applied and Theoretical computing and Communication Technology (2017)

7. Movva pavani, P.Trinatha Rao.:"Urban air pollution Monitoring using Wireless Sensor Network". In: International Journal of communication networks and Information security (2017)

8. Ashwini, R., Pooja Mohani,: "Application of Wireless Sensor Network in home automation" . In: International Journal of computer and organization trends (2014)

9. Abbas, S.K., Abedini, M., Faraneh, Z., S.A.R Al-Haddad.: "Cluster Head Selection Using Fuzzy Logic and Chaotic Based Genetic Algorithm in Wireless Sensor Network". In: J. Basic. Appl. Sci. Res. (2013)

10. Nagarajan, M., Mayuranathan, M., Jayanthi, S.: "Fuzzy clustering Life Span Fortification with Data Compression, Nearest Neighbor Technique and Elliptical Curve Cryptography in WSN". In: International Journal of Advanced Research in Computer Science and Software Engineering. (2013)

11. Jamali, S., Hatami, M.: "Coverage aware scheduling in wireless sensor networks: An optimal placement approach". In: Wireless Personal Communications. (2015)

12. Milica Pejanović durišić, Zhilbert Tafa, Goran Dimić, Veljko Milutinović.: "A Survey of Military Applications of Wireless Sensor Networks". In: Mediterranean Conference on Embedded Computing, MECO. (2012)

13. Kalaiselvi, S., Tamilselvan, S.: "Cognitive Wireless Sensor Network Merits, Applications, Practical Difficulties and Research Trends", In: International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-7, Issue-5S3. (2019)

14. Nupur Parihar.: "A Review Paper on Healthcare and Hospital Monitoring System Using Wireless Sensor Network". In: International Journal of Computer Science and Mobile Computing, Vol.8 Issue.1. (2019)

15. Mohammed Al-khafajiy, Thar Baker, Carl Chalmers1, Muhammad Asim, Hoshang Kolivand, Muhammad Fahim, Atif Waraich.: "Remote health monitoring of elderly through wearable sensors". (2019)

16. Mohammad Abujubbeh, FadiAl-Turjman, Murat Fahrioglu.: "Wireless Sensor Networks In Smart Grids: An Overview".(2019)

17. Akhil Nigam, Inderpreet Kaur, Kamal Kant Sharma.: "Smart Grid Technology: A Review". In: International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-7, Issue-6S4.(2019)

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Data Science based Architecture for the Educational Domain

Dharmendra Patel, Urvish Talaviya, Atul Patel

Abstract :

Educational domain is an appropriate area for the data science as the educational processes involve rich set of data. These data have led interest to achieve useful, interesting and hidden insights after proper analysis. Data science based analytics are very vital to achieve insights from processes of an educational domain. In this article , we will discuss the data science centric processes of an educational domain. The article also will depict the architecture of data science in the educational domain.

Introduction

Data Science is an emerging field of research and it contributes to any domain by numerous ways such as :

- Empowers the authority to make better decision
- Helps in determining the trends of any entity
- Directs the actions in order to define the goals
- Helps the employees to adopt the best practices
- Helps in recruiting the right skilled people in the organization
- Stakeholders can find the opportunities based on quantifiable insights

Data Science in the educational domain offers numerous benefits to all stakeholders of educational institutions. The following table depicts the benefits of data science for the different stakeholders of educational domain.

Table 1 : Data Science Benefits for different stakeholders

S. N.	Stake Holder	Data Science Benefits
1.	Teacher	- Grouping of regular and irregular students based on statistical and visual representation - Bifurcation of students based on performance - Prediction of student performance based on previous dataset - Classification of student based on fast, average and slow learners - Correlation among students for different parameters - Anomaly detection among different courses results - Atomization of student related processes, i.e. attendance - Learning analytics from Learning Management System(LMS) - Analysis of student performance based on the type of question, i.e. high order thinking, average order thinking or low order thinking
2.	Student	- View attendance and results in effective visual comparison form - Extract academic information effectively

3.	Principal/ Management	• Get managerial insights related to students, faculty members and other stakeholders.
4.	Parents	• Visualize ward academic progress .
5.	Accountant	• Generate insights about financial aspects.
6.	Counselor	• Visualize academic and other aspects of the students under his/her counseling.

Related Work

Educational data are indispensable for the making of various decisions , determine the strengths and weaknesses of the organizations and assessing the progress of the students[1,2]. Data Science is the field with the help of that any organization can generate meaningful insights to make better decisions, assess any aspect efficiently and determine the predictions of different parameters[3,4]. Data Science can deal efficiently with large and heterogeneous data set so best suited for an educational domain[5].Mor. Ferguson and Wasson in 2015 discussed the importance of data in educational domain[6]. They concluded that the data of educational domain is vital for the designing better learning environment. Data Science stimulates new ways in educational domain as it can answer the several research questions related to education[7].

Anomaly detection, Clustering , Association, Regression, Classification are common data science techniques that are applicable to almost all kind of business problems. The following table shows the research description carried out in educational domain.

Table 2 : Data Science techniques in Educational Domain

| S.N.	Author(s)	Data Science Technique used in	Research Contribution
1.	Jan Geryk et al. [8]	Anomaly Detection	New method was found for automated finding and visualizing anomalies for various academic analytics tasks.
2.	Mr. Doipayan Roy et al. [9]	k-means clustering	Method using k-means clustering was used to obtain learner groups in highly technical and advanced engineering MOOCs.
3.	Shibbir Ahmed et al.[10]	Association Rule Mining	Association Rule Mining was used to discover the knowledge regarding the academic performance and personal statistics of students.
4.	M. Wook et.al[11]	Clustering	K-means and Hierarchical clustering techniques were used for students annotations
5.	A. Bovo,S.[12]	Clustering	K-means clustering is used to determine positive and negative cognitive skills set of the students.
6.	P. Golding et.al[3]	Hierarchical Clustering	Mapping of teacher profiles on the basis of their score.

Data Science Based Architecture For Educational Domain
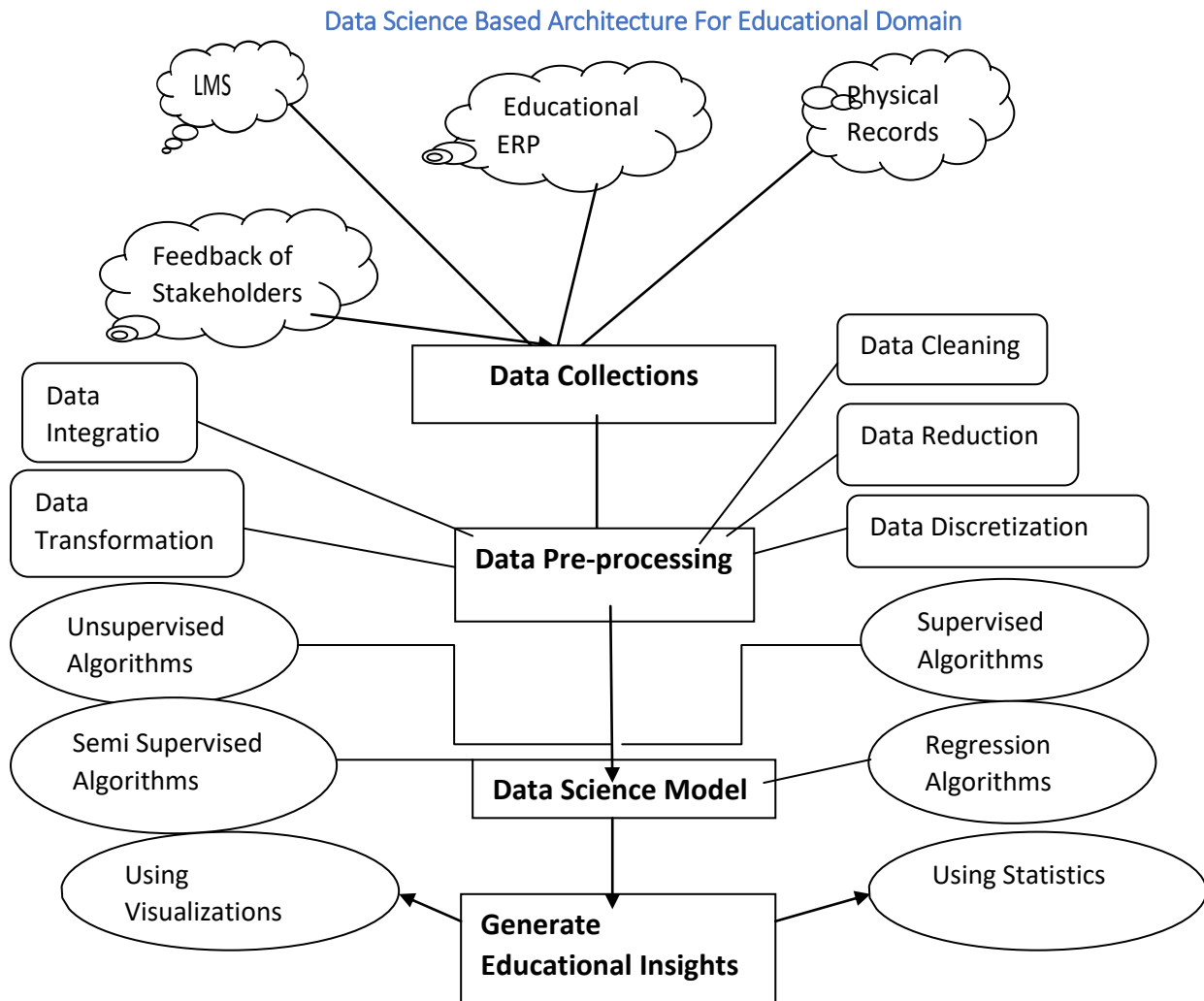
Figure 1. Data Science based Educational Domain Architecture

Data Collection : Educational domain contains enormous amount of data scatter in different locations and formats. Learning management systems contains the data related to students, courses, results, the content of the syllabus etc. Educational ERP consists of number of modules such as : Academics, Examinations, Research, General Administration, Human Resources, Accounts, Finance , Budget, transportation, Hostels etc. Each module consists of several submodules so contains enormous amount of data. Several data resides in the physical file format. Besides this , feedback from all stakeholders play an important role while generating meaningful insights from the educational domain.

Data Pre-processing : Data pre-processing is the vital for any data science project. It takes near about 80% time and efforts to make the project successful one. Data Preprocessing involves :

Data Cleaning : it includes imputing missing values, resolving the inconsistencies and dealing with the noisy values.

Data Integration : This step is crucial for the educational domain as data are coming from diverse applications or sources. It deals to put the different representations of the data together and remove the conflicts associated with it.

Data Transformation : It includes normalization, aggregation and generalization of the data.

Data Reduction : It includes the essential features extraction from the vast variety of features.

Data Discretization: It deals with continuous variables. With this step, values of continuous attributes reduce by separating the assortment of attribute spaces.

Data Science Model : Data science model is formed by analyzing the nature of the problem. Data science based problems are generally classified as :

Supervised in nature : The data in such problem can be classified into two or more classes. The data science model predicts the class of unseen data. For example : Classify the students into fast, average and slow learners. When we enter the new data of student, the model will automatically predict the appropriate class i.e. fast, average or slow learner for the new student. Logistic regression, Naïve Bayes, Support Vector Machine, Nearest Neighbors, Decision Tree, Boosted Tree, Random Forest, Neural Networks are popular supervised algorithms.

Unsupervised in nature : No labels are given in such problems. The main intention of such technique is to group the data with similar kind of characteristics/features. Suppose we want to bifurcate the students based on their similar behavior then we can opt such kind of technique/model. The main algorithms in this category are k-means clustering, mean-shift clustering, DBSCAN, Expectation-Maximization, Agglomerative Hierarchical Clustering.

Semisupervised in nature : The problem in which you have large amount of data but only few data having the label. For example , the archive of the images of student activities where only few images having event title, the rest does not not contain any information. Semisupervised learning algorithms use both supervised and unsupervised techniques to resolve such issues.

Regression Algorithms : It is also a supervised learning problem, but the outputs are continuous rather than discrete. For example, predicting the CGPA of the student based on the previous semesters CGPA.

Generate Educational Insights : After establishment of the model successfully, it generates insights that are very vital for the development of the educational domain. Educational insights can be generated in visual forms or statistical forms by the model. Visualization techniques can be categorized as : charts, plots, maps, diagram and matrices.

Conclusion

Educational Organizations use ERP, physical files, online learning management tools and techniques for the data management of different processes and stakeholders. Educational organizations store abundant data every day and these data contains interesting patterns that will help any organization

in numerous way. Data Science is the technique that helps any organization to get meaningful insights from the abundant data. This article presented the general architecture of the data science in the context to the educational domain. The architecture discussed the major framework activities of the model. This model acts as a base model for any kind of insights related to educational domain. The only thing is to decide the appropriate data science technique in the context to the problem statement.

REFERENCES

[1] Bowers, A. J. (2009). 'Reconsidering grades as data for decision making: More than just academic knowledge'. Journal of Educational Administration, 47(5), 609-629.

[2] Wayman, J. C., & Stringfield, S. (2006). 'Data use for school improvement: School practices and research perspectives'. American Journal of Education, 112(4), 463-468.

[3]Provost, F., & Fawcett, T. (2013). Data science and its relationship to Big Data and data-driven decision making. Big Data, 1, 51–59

[4] Klasnja-Milic´evic´, A., Ivanovic´, M., & Budimac, Z. (2017). Data science in education: Big Data and learning analytics. Computer Applications in Engineering Education, 9999, 1–13. Retrieved November 2, 2017, from https://doi.org/10.1002/cae.21844.

[5] Dede, C., Ho, A., & Mitros, P. (2016). Big Data analysis in higher education: promises and pitfalls. EDUCAUSE review August 2016 (pp. 8–9). Retrieved September 1, 2016, from http://er.educause.edu/articles/ 2016/8/big-data-analysis-in-higher-education-promises-and-pitfalls

[6] Mor, Y., Ferguson, R., & Wasson, B. (2015). Editorial: learning design, teacher inquiry into student learning and learning analytics: a call for action. British Journal of Educational Technology, 46, 221–229.

[7] Dede, C., Ho, A., & Mitros, P. (2016). Big Data analysis in higher education: promises and pitfalls. EDUCAUSE review August 2016 (pp. 8–9). Retrieved September 1, 2016, from http://er.educause.edu/articles/ 2016/8/big-data-analysis-in-higher-education-promises-and-pitfalls

[8] Jan Geryk,Lubos Popelinsky(2016). Visual Anomaly Detection in Educational Data. International Conference on Artificial Intelligence: Methodology, Systems, and Applications AIMSA 2016: Artificial Intelligence: Methodology, Systems, and Applications, pp 99-108.

[9] Mr. Doipayan Roy, Prof. Peter Bermel, Dr. Kerrie Anna Douglas, Prof. Heidi A. Diefes-Dux, Mr. Michael Richey, Dr. Krishna Madhavan,Sidhdharth Shah(2017), Synthesis of clustering techniques in educational data mining, American Society for Engineering Education.

[10]Shibbir Ahmed, Rajshakhar Paul ,Abu Sayed Md. Latiful Hoque(2014), Knowledge discovery from academic data using Association Rule Mining, 17th International Conference on Computer and Information Technology (ICCIT),IEEE.

[11] M. Wook, Y. H. Yahaya, N. Wahab, M. R. M. Isa, N. F. Awang, and H. Y. Seong, "Predicting NDUM student"s academic performance using data mining techniques," in Proc. 2009 Second Int. Conf. Comput. Electr. Eng., 2009, pp. 357-361.

[12] A. Bovo, S. Sanchez, O. Heguy, and Y. Duthen, "Clustering moodle data as a tool for profiling students," in Proc. 2013 Second Int. Conf. E-Learning E-Technologies Educ., Sep. 2013, pp. 121-126.

[13] P. Golding and O. Donaldson, "Predicting academic performance," in Proc. Front. Educ. 36th Annu. Conf., 2006, pp. 21-26.

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Smart Dustbin Using IoT Technology

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Pradnya Sudhakar Gawai

Abstract :

As urbanization increases, we have an increase in the garbage around the urban area. Waste management is very important for a healthy and clean environment. Segregation of wet and dry waste is important for maintaining the hygiene. Manually it is difficult to segregate wet and dry garbage. Usual dustbin requires to be open by press foot against its lever and then throwing garbage. Also person needs to track when it is full so that it can be emptied and does not overflow. Here we propose a smart dustbin that operates automatically to help solve this issue using IoT. Smart Dustbin is IoT based project which is implemented by using Arduino (Software and hardware platform for communicating with IoT Sensor). Smart dustbin is fully automated bin which can open and close their lid, segregate the garbage and detect the garbage level automatically by using the different kind of sensors. For communicating with IoT senor we used the Arduino platform. In our project, we used some commonly used Sensors such as ultrasonic sensor, soil moisture sensor, servo motor, LED for display purpose. Breadboard for providing extra connections, battery for power supply, Arduino board for programming, Arduino interface for building and testing the programming logic, jumper wires for connecting purpose.

Benefits:

- Smart dustbin is automatically open its lid when detect obstacle as shown in figure1.
- Achieve the segregation of wet and dry trash automatically as illustrated in figure2.
- Detect the level of dustbin is shown in figure3.
- LED will blink to notify that how much bin is get filled.
- Automatic and Time-Saving.

Working :

We designed our bin in a very simplified manner. There are two compartments in our bin one for wet and another is for dry waste. Before the segregation task, one more opener or lid is provided. Firstly we use the Ultrasonic sensor for detecting the obstacle, if the obstacle found then it will open the lid of bin automatically. To achieve this mechanism we used servo motor which will rotate in 180-degree angle, we programmed in such way that if the obstacle is in range of 30cm then only it will be detected. Once the lid of bin is opened the user can throw the garbage on garbage holder. On garbage holder, we placed the soil moisture sensor which is responsible for the segregation of wet and dry garbage. As the Garbage thrown on garbage holder, the working of the soil moisture sensor gets started. Soil moisture sensor works on water level present in garbage. If

the water level is high it will produce the high electricity and low resistance. If the resistance is low resulting garbage is wet otherwise garbage detected as dry waste. According to resistance, we segregated the wet and dry waste. For implementing this mechanism we use again two servo motors. We programmed in such manner that if the garbage is wet the servo motor will be rotated clockwise in 180 degree so that the garbage holder move towards the wet compartment and garbage automatically drops into the wet compartment. If the garbage is dry the servo motor will rotate anti-clockwise in 180 degree so that the garbage holder move towards the dry compartment and garbage automatically drops into the dry compartment are shown in figure4.

Figure 1 : Ultrasonic Sensor to detect obstacle

Figure 2 : Segregation Pan to separate dry and wet waste

Figure 3 : Inner Ultrasonic Sensors to detect level of each compartment

Figure 4 : Side Drawers for Dry & Wet Waste

For level detection we used an ultrasonic sensor which will detect the level of trash inside the dustbin and it can be shown in figure3 which is using some level in unit percentage i.e., 0%(Empty)

50%(Half filled), 75%(2/3 Filled), 100%(Full). And this level will be shown using an LED blink which is placed on the dustbin. For level detecting, we programmed using in Arduino IDE.

Conclusion:

By using IoT technology (IoT sensors and Arduino IDE) we designed Smart Dustbin, which is fully automated and does not require any human interaction. We achieved our objective that is detecting obstacle, detect level and segregation.

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Internet of Things

K.Thulasim, S.Hemalatha

Introduction:

Kevin Ashton, one of the founders of the Auto-ID Center at MIT has coined the term "Internet of Things". He discovered how to link objects to the internet through machinery. He first used the phrase "Internet of Things" in a 1999 presentation.

Today we are living in the world with full of machinery, computers and technology. All these are possible only because of internet of things which has brought a great privilege to our nation life is made possible to many younger generations in medical and health care centers due to advanced machinery present in the hospitals, transportation, management of energy and what not, is possible with internet of things.
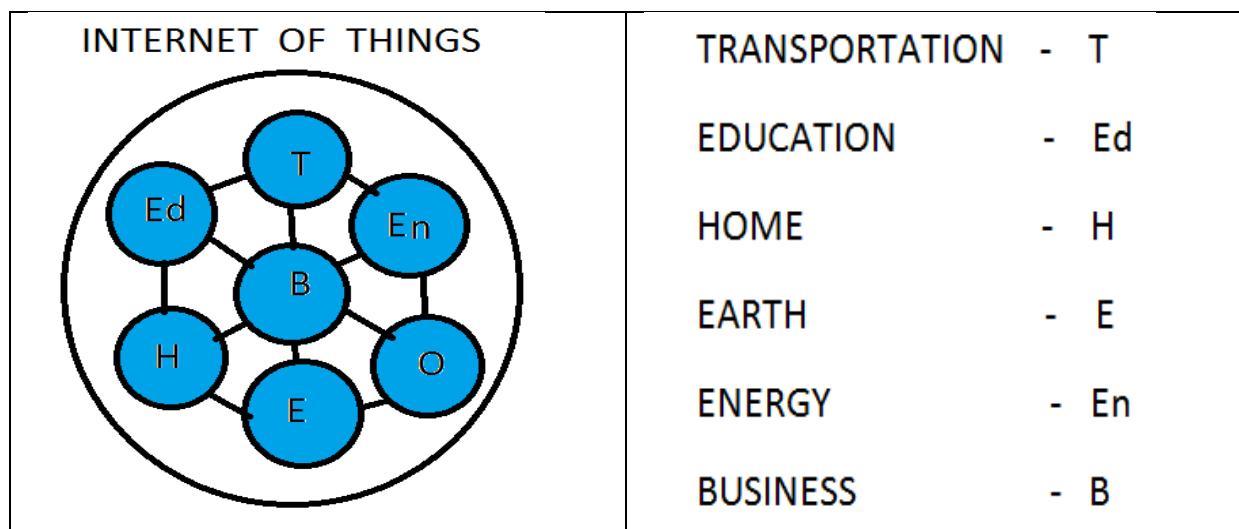

These networks connected with security and management capabilities. This will allow IoT to become more powerful in what it can help people to achieve.

These IoT connected devices and machines range like smartwatches to RFID inventory tracking chips. IoT connected devices communicate via networks or cloud-based platforms connected to the Internet of Things. The real-time applications from this IoT collected data enhance digital transformation. The health and safety, business operations, industrial performance, and global environmental issues are mainly depending on internet of things.

At present iot is facing with many challenges such as discovery, power supply, software complexity, wireless communication and short range communication, data interpretation and many others.

Future Of IOT
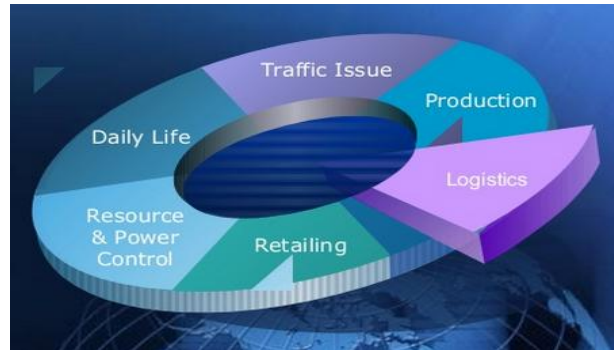
"Internet of Things" is playing an important role in the automatic networking systems by using sensors.

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Bio-Computers

Parlapalli Anuhya, S. Hemalatha

Scientist found DNA has the capability to build a computer. Leonard adleman also called the father of DNA computing, scientist at California university proposed the idea of DNA of solving complex problems. He used DNA to solve the travelling salesman problem which is the most complex problem for general computing. In 2002, researchers from Weizmann institute of science has composed a computing machine of enzymes and DNA molecules instead of silicon microchips.

DNA computer is a molecular computer that works biochemically. It computes with enzymes that react with DNA causing chain reactions. This chain reactions result in computation. DNA computing is used to compute complex problems in parallel manner.

The need for bio-computers make clear by using them in most efficient way. These needs include silicon processors has limited space in which a molecule of DNA holds memory of 45 disks. Also the chips are non-biodegradable elements where as DNA is bio-degradable. The most important need is that we know that our natural resources are degrading day by day, instead DNA is the vast available raw material.

Biological Computing

Components of a DNA computer include logic gates and biochips. Logic gates can be combined with DNA microchip to make bio chip.

The first and the foremost advantages that a bio-computer includes are parallel computing, in the sense performing millions of operations simultaneously. The light weight of the bio chip afford easy transportation. It also solves complex problems quickly and can efficiently handle massive amounts of working memory.
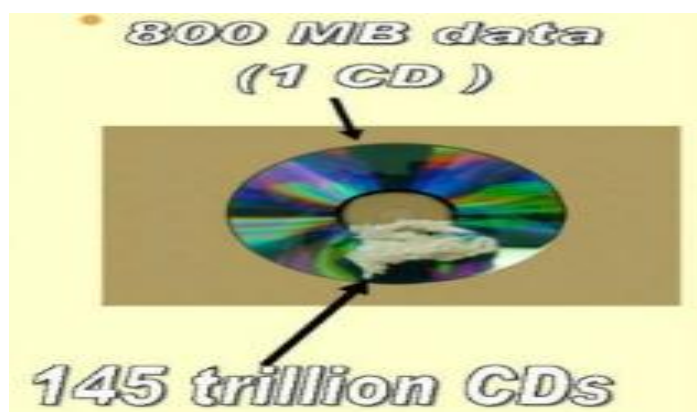
The drawbacks that it has made it not available to an individual use. The first developed DNA computer is slow in its speed of operating and it also needs human assistance for computations and various other purposes.

First generation DNA computers are useful to government to break secret codes, used in airlines to map efficient routes and to understand about the human brain which is the natural super computer. The future of DNA computer is very bright in the field of solving complex problems where a silicon computer fail to perform.

If the drawbacks are being solved by the scientists and researchers then it will eliminate silicon based super computers. DNA computers are to be introduced in a most efficient way in future. Bio-computers will redefine the boundaries of computer science.

It may take years to work out on this project, but there will be a great change that had ever happened in the history of computer science.

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Cloud Computing

Shifana Tasneem, S. Hemalatha

Introduction:

Cloud computing is becoming one of the keywords of the IT industry. It is the act of transferring various computing operations such as acting as servers, database system, network management, software based task. Cloud computing is the latest of computing process. It promises to change the way people accessed or used computing resources. By using internet as backbone, cloud computing provides an end user interaction with cloud. Cloud computing has lots of acts to serve user of all kinds. Cloud usually refers as web or simply internet. it can provide services from and over other networks. It supports WAN,LAN or VPN. They are various application which makes use if cloud such as email , online games etc. cloud computing is combination of both hardware and software, it makes use of computing operation to provide network services.

They are three main components of cloud computing such as client computers, distributed servers and datacenters . Clients are the devices that provides end user interaction with cloud. Client usually means of sharing a system with n number of system. They are three types of clients : mobile, thick and thin clients. Cloud service has become popular due to reduce complexity of network , there is no need to buy software licenses, the information in cloud is not easily lost , any number of user can access a network at a time.

The main of advantage of cloud computing are Flexibility, easy to use, data can be recovered easily, any number of user can access the network at a time, security and environment friendly. Cloud computing provides very high performances and speed. Data was be easily backup that is main point to be noted that there are no loss of your data. Mostly companies are providing automatic data backup and recovery options. This might helpful for business to recover your deleted and important files and data. In cloud, they provide us with large storage capacity. The main benefits of cloud computing services is, we can easily access to our account information, use it and make changes in it from anywhere in the world. We just need to remember our e-mail and password to login to our cloud account.

Disadvantages of Cloud Computing - Security Problems, Costly ,Data Transfer Fee

If you have a large amount of data and want to transfer from one device to another device or want to download it. we may have to pay the fee according to the terms and conditions.
After having discussed the merits and de-merits it clearly stands out that there is no clear answer in favor or against of cloud computing. So far it seems that is going to be a hybrid solution from the corporate standpoint. Legal matters are cleared from cloud computing whereas simple canned applications will become more and more popular in the cloud space. The concept and technology is to stay but it still in its infancy and there is a long road ahead to get to maturity.

CLOUD IS ABOUT HOW YOU DO COMPUTING, NOT WHERE YOU DO COMPUTING

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Origami Robots

S. S. Swethapriyadarshni, P.Ruchitha, P.Yuvarani, S. Hemalatha

Introduction:

Ever swallowed a button battery? And thought of expelling out of the body. Yes, we have a solution of getting rid of it. ORIGAMI ROBOT which is the latest technology that immix both pharmaceutical and technology. That's right , MASSACHUSETTS INSTITUTE OF TECHNOLOGY [MIT] has come up with an amazing innovation which is pill-sized origami robot, which helps to eject the unwanted plastics and non-dissoluble objects safely out of the digestive system.

How It Works?

Origami robot is folded inside a pill that is wanted to be swallowed . After entering the mouth it travels through throat and reaches the stomach, at that moment it will unfold itself, which will exactly navigate the wounds and clear the patches using the external magnetic field.
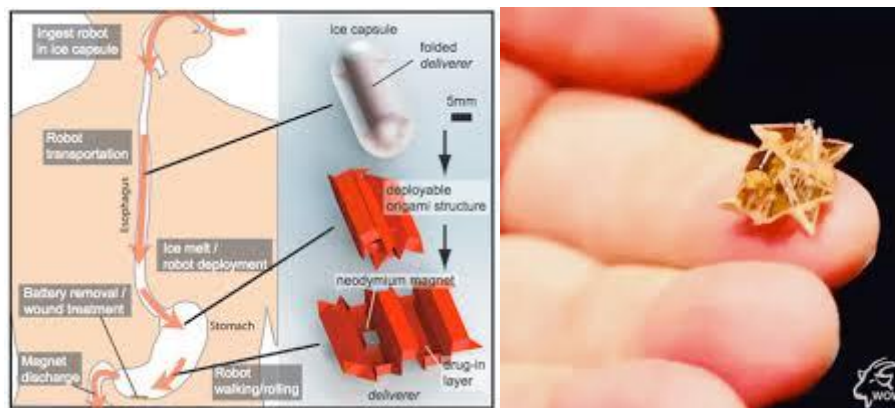
Why To Use Origami?

According to MIT, in US more than 3,500 people engulfed the small batteries each year. If they have prolonged contact with the stomach or oesophagus they can burn the tissues inside the body. This situation describes how hazardous an accidently swallowed button battery that influence the tissues of the body. T o eradicate this issue origami is used.

Trials:

Several tests were taken to invent this tiny robot. After a plenty of trials scientists settled down with the structural material that was a type of dried pig intestine used in sausage casings they lavished a lot of time at Asian market and Chinatown for requirements. Making this concept error free several tests were induced on humans and finally scientists succeeded in achieving a creative invention.

Purpose of this Innovation:

To ensure the preferable health of human beings. To promote well being of environment. To explore technology along with medical field.

Benefits:

- Easy to swallow.
- Moves smoothly by external magnetic field.
- Has tiny flippers to swim around in stomach fluids.
- Can be used to deliver medicines to specific parts of the body.

Drawback:

- They cannot carry large objects.

Conclusion:

In this practical and highly competitive world the innovative Origami concept will play a major role in upcoming applications.

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Robotic Process Automation

Adelin Kiruba S, Malavika R, Pavithra R, S. Hemalatha

The Robotic Process Automation commonly known as RPA is one of the emerging technologies in the computer industry. In this new age of technology this process is used to reduce the complexity of manual task. It is used has business process automation software.RPA has become a common entity in day to day life to save time and redundancy. These tasks include transaction, automated online assistant etc. RPA is basically a set of specialized programs that are uploaded in a software which does the automation process. These complements manual strategies and keeps the process form being disrupted. They automate the task given using artificial intelligence technology.

For example, in database management system if one wants to update a value in it. It is in convenient to update manually each and every time, whereas if automation is done the values are updated without any interruption or man force. Since automation process is used the information that one view can be extracted into a excel file to easily sort out the required condition. RPA plays a vital role in the place of transaction earlier knowing the details about one's account was a tedious process. When automation is in to the picture the information is easily gathered without any error with in a fraction of second. The RPA technology enables few automations like desktop automation, virtual work force and virtual API's extending IT architecture. Automation has become a solution in our daily routine which are capable in working on critical tasks. RPA has become the fast-growing technology in global market. RPA tools are used to configure the process that has to automated. The commonly used RPA tools are Uipath, blueprism, automation anywhere. The RPA maintains uniformity, efficiency and accuracy. The most significant feature of RPA is it does not require great coding knowledge. Implementing RPA reduces manual error, consistency, scalability and improve quality.

RPA as the ability to fill missing elements of process across system integration. It acts as a main key for solving automation challenges and problems. It can bring transformation in process and operation. RPA improves productivity and as special features like multitasker. Process recorder, remote viewer and integration As a whole it is understood that RPA has a significant role to play for the welfare of human beings.

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Robotic Surgery

Sarah Susan Abraham, Jerrish Carol. J, S. Hemalatha

Introduction

Robotic surgery or Robot-Assisted Surgery is the combination of cutting-edge computer technology and the experience of expert surgeons. This technology provides a 10x magnified, high-definition, 3D-image of the complex and detailed anatomy of the body to the surgeon.

Overview

Robotic surgery is basically a high-tech medical surgery with specialised instruments such as camera arm and mechanical surgical arm with all the surgical instruments. It provides 3D clear view of the site of operation so that it avoids excessive bleeding also effective surgery is performed in the critical situations.

Nowadays robotic surgery is upheld by all modern medical specialist but yet they are not considered as significant also it has its own ethical issues where infections are possible and at times it is considered to invasive thus it is recommended by the doctors to ask for second opinion under ethical and surgical context.

Major benefits are found when the surgeon controls and manipulates the console's controls of surgical instruments which are smaller, versatile and manoeuvrable robotic surgical instruments than the human hand. The robot replicates the hand movements of the surgeon while minimizing the tremors of the human hand. And even during the most complicated operations, the surgeon can work with improved precision, flexibility and with more control.

DA VINCI Robotic System

The da Vinci Surgical System is a robotic surgical system made by the American firm Intuitive Surgical and it was approved by the Food and Drug Administration back in 2000. For instance, if we are diagnosed with a condition that requires surgery; until recently our options would be open surgery or laparoscopy. But now, we have a breakthrough technology called the Da Vinci Robotic System which is a minimally invasive surgical procedure for complex surgery and is controlled by a surgeon from a console.

The da Vinci Si has two separate but connected sections:

- The tower
- The console

The tower: The tower is positioned directly above the patient during surgery. It contains the four arms of the robot three which can hold a variety of surgical instruments, and a fourth which holds

3D cameras of the system. These arms are controlled by a computer that replicates the operating surgeon's movements exactly.

The console: The console is where the surgeon sits and operates the controls of the robot while looking into a stereoscopic monitor which provides an enhanced three-dimensional view of the surgical site in high definition. The surgeon controls the robot's arms by manipulating two master controls that give the fingertips flexibility and precision of movement.

How does this system help surgeons?
They make the surgical procedure easier and more efficient than ever.

3 dimensional HD vision: The two high-definition stereoscopic cameras of the system give the surgeon a magnified and detailed view of the surgical site on the body; combining superbly accurate depth perception with a 40 percent sharper image than it's previous models.

An additional arm: This extra arm can be used to hold a retractor or any other surgical instrument, giving the surgeon an expanded working capacity of 50 percent.

Instant image referencing: This ingenious feature allows the surgeon to display up to two diagnostic images (ultrasound or CT scans taken prior to the surgery) of the area being operated on inside the Da Vinci monitor, directly alongside the view of the real-time procedure — providing a critical additional reference where necessary.

Extra-mobile "wrist action": The patented mechanical wrists of the Da Vinci System works just like that of a human's but with a wider range of motion and flexibility.

Scalability: This innovation helps the surgeon to adjust the robot's arm to move a fraction of an inch for each inch of the surgeon's hand movements which simplifies the most complex movements, including delicate resections, suturing and knot-tying.

A footswitch is also operated by the surgeon which gives the ability to shift back and forth between two energy sources.

Touchpads allow the surgeon to easily adjust video and audio settings of the system.

The alignment of the entire system is designed in such a way so as to keep the surgeon in a relaxed and focused position at all times.

Finally, the rest of the surgical team is provided with additional video screens that display the two-dimensional view of what the surgeon is looking at through the stereoptic monitor of the Da Vinci system.

With the Da Vinci System, one can find no clumsy movements

Advantages of the Da Vinci System:

- It features the benefit of definitive treatment with radically lesser pain.
- Shorter hospital stay.
- Faster recovery and return to normal activities.

Conclusion

The art of surgery has tipped off the edge along with the field of robotics thus making difficulties simpler sophisticated and effective in performance now it all lies in the hands of the practitioners and the society to make it effective and enhance the technology to greater levels.

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Ransomware Attack

Ganta Yaswanth Sai Reddy, Indra Priyadharshini S

Abstract:

Ransomware holding steady as one of the most significant threats facing businesses and individuals today, it's no surprise that attacks are becoming increasingly sophisticated, more challenging to prevent, and more damaging to their victims. Most of these attacks were targeted to SMBs, although ransomware initially targeted primarily individuals – which still comprise the majority of attacks today.

Introduction:

Ransomware has been a prominent threat to enterprises, SMBs(Server Message Block is the transport protocol used by Windows machines for a wide variety of purposes such as file sharing, printer sharing, and access to remote Windows services), and individuals alike since the mid-2000s. In fact, there were more than 7,600 ransomware attacks reported to the Internet Crime Complaint Center (IC3) between 2005 and March of last year, outnumbering the just over 6,000 data breaches reported during the same time period. In 2015, IC3 received 2,453 ransomware complaints that cost victims over $1.6 million. Those figures, however, represent only the attacks reported to IC3; the actual number of ransomware attack victims and costs is likely much higher and it is difficult to estimate with precise accuracy.

What is Ransomware?

Ransomware is a type of malicious software from cryptovirology that threatens to publish the victim's data or perpetually block access to it unless a ransom is paid. While some simple ransomware may lock the system in a way which is not difficult for a knowledgeable person to reverse, more advanced malware uses a technique called cryptoviral extortion, in which it encrypts the victim's files, making them inaccessible, and demands a ransom payment to decrypt them.

Fig.1: Ransomware

Fig.2: Encryption of files

The First Ransomware Attack:

While it has maintained prominence as one of the biggest threats since 2005, the first ransomware attacks occurred much earlier. According to Becker's Hospital Review, the first known ransomware attack occurred in 1989 and targeted the healthcare industry. 28 years later, the healthcare industry remains a top target for ransomware attacks. The first known attack was initiated in 1989 by Joseph Popp, PhD, an AIDS researcher, who carried out the attack by distributing 20,000 floppy disks to AIDS researchers spanning more than 90 countries, claiming that the disks contained a program that analyzed an individual's risk of acquiring AIDS through the use of a questionnaire. However, the disk also contained a malware program that initially remained dormant in computers, only activating after a computer was powered on 90 times. After the 90-start threshold was reached, the malware displayed a message demanding a payment of $189 and $378 for a software lease. This ransomware attack became known as the AIDS Trojan, or the PC Cyborg.

Evolution of Ransomware:

Early ransomware developers typically wrote their own encryption code. Most ransomware is spread hidden within Word documents, PDFs and other files normally sent via email, or through a secondary infection on computers already affected by viruses that offer a back door for further attacks.

Today's attackers are increasingly relying on "off-the-shelf libraries that are significantly harder to crack," and they're also leveraging more sophisticated methods of delivery, such as spear-phishing campaigns rather than the traditional phishing email blasts, which are frequently filtered out by email spam filters and some sophisticated attackers are developing toolkits that can be downloaded and deployed by attackers with less technical skill. Some of the most advanced cybercriminals are monetizing ransomware by offering ransomware-as-a-service programs, which has led to the rise in prominence of well-known ransomware like Crypto Locker, Crypto Wall, Locky, and TeslaCrypt. CryptoWall alone has generated more than $320 million in revenue.

By 2015, multiple variants impacting multiple platforms were wreaking havoc on users around the world, and the landscape continues to evolve today. From April 2014 to March 2015, the most prominent ransomware threats were CryptoWall, Cryakl, Scatter, Mor, CTB-Locker, TprremtLocker, Fury, Lortok, Aura, and shade. "Between them they were able to attack 101,568 users around the world, accounting for 77.48% of all users attacked with crypto-ransomware during the period.
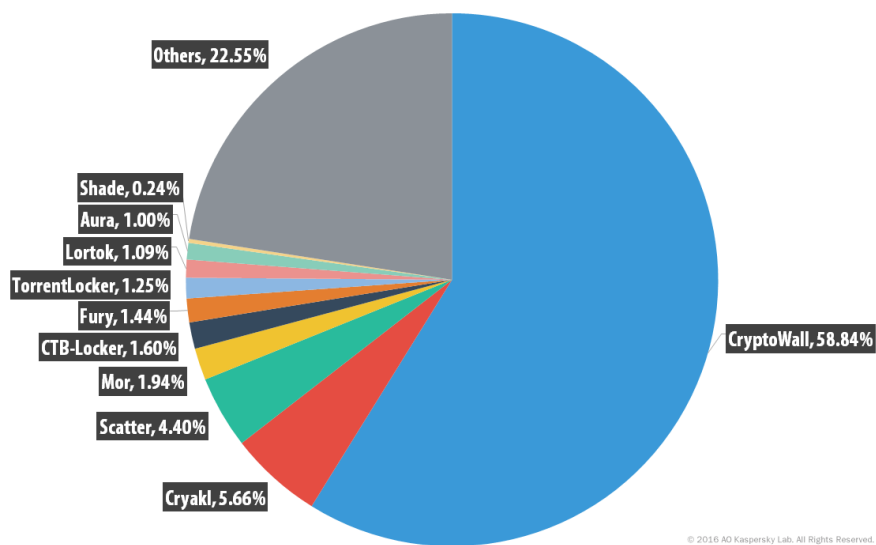
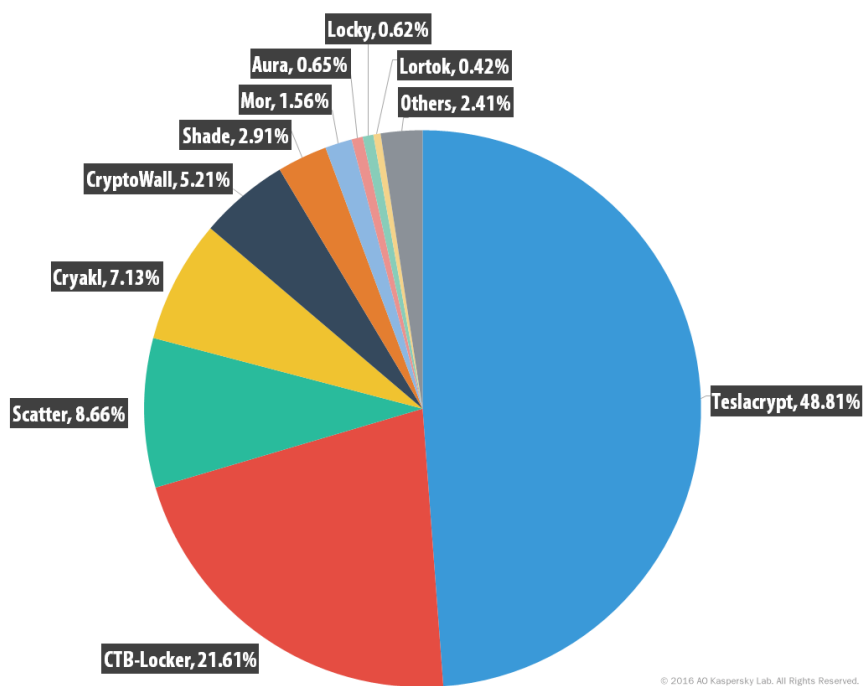Fig.3:Percentage distribution of ransomware variants in 2014-2015.

Fig.4:Percentage distribution of ransomware variants in 2015-2016.

Various Ransomware Attacks:

WANNACRY

On 12 May 2017, an updated version of WannaCry ransomware called "WanaCrypt0r 2.0" struck hospitals belonging to the United Kingdom's National Health Service (NHS), internet service provider Telefonica, and other high-profile targets around the world. Each victim subsequently received a note demanding $300 in Bitcoin as ransom.

Researchers later determined that WannaCry made its rounds by exploiting EternalBlue, a vulnerability which Microsoft patched in a security bulletin in March 2017. It's believed bad actors incorporated EternalBlue into WannaCry's delivery and distribution mechanism after a band of criminals known as the Shadow Brokers leaked EternalBlue and other exploit code stolen from the Equation Group hacker collective onto the public web. In total, WannaCry affected more than 300,000 organizations worldwide.

NOTPETYA

News of NotPetya first broke on 27 June 2017 when power distributors in Ukraine and the Netherlands confirmed hacking attacks that affected their systems. Researchers quickly traced the attacks to Petya, a form of ransomware which encrypts the Master Boot Record. They also observed how those newer variants were abusing the same Eternal Blue vulnerability as exploited by WannaCry for distribution.

A closer look by Kaspersky Lab, however, revealed that Petya wasn't actually involved in the worldwide campaign. The responsible malware borrowed large chunks of code from Petya, but it behaved as a wiper in that it offered no way for users to recover their affected data. For that reason, Kaspersky named the threat "NotPetya."

BADRABBIT

A week before Halloween, Kaspersky Lab revealed it had received "notifications of mass alerts" of a new ransomware targeting Ukrainian and Russian organizations.Kaspersky's researchers ultimately identified the threat as BadRabbit. Unlike WannaCry and NotPetya, BadRabbit did not exploit Microsoft vulnerability for distribution. Instead it used drive-by attacks to deliver the ransomware dropper, a smaller-scale operation which demanded 0.5 Bitcoins in ransom from only hundreds (not hundreds of thousands) of victims.

CRYPTOWALL

Another major ransomware Trojan targeting Windows, CryptoWall, first appeared in 2014. One strain of CryptoWall was distributed as part of a malvertising campaign on the Zedo ad network in late-September 2014 that targeted several major websites; the ads redirected to rogue websites that used browser plug-in exploits to download the payload.

CryptoWall 3.0 used a payload written in JavaScript as part of an email attachment, which downloads executables disguised as JPG images. When encrypting files, the malware also deletes volume shadow copies, and installs spyware that steals passwords and Bitcoin wallets.

LOCKY

Since its discovery in February 2016, Locky and its ever–multiplying variants have relied on spam botnets like Necurs for distribution. The crypto-ransomware went dark in early 2017. However, it resurfaced in August with one of its largest campaigns yet: 23 million spam messages sent out over a 24-hour period. Detected by AppRiver, the operation sent out emails containing subject lines like "pictures" and "documents" that bore a request to "download it here." The emails come with a ZIP attachment that contains a Visual Basic Script (VBS) file. This file, in turn, pulls down Locky.

Fig.5: CryptoLocker   Fig.6: WannaCry

How can we prevent it?

We can prevent it with these three measures stated below

- Disable windows SMB feature which will be enabled by default.
- Go to control panel >Programs >Programs and features>Turn Windows features on or off>SMB V1.0/CIFS file sharing support
- Install Windows Update MS17-010 released by Microsoft on 14th March 2017
- Do not click any suspicious links from emails, google docs or anywhere on the internet. Update your system even if you're using an unsupported operating system like windows XP,7 Microsoft has released the patch for those systems too.
- Update all security measures on your system and Keep your Antivirus updated.
- Do not download from doubtful websites and be aware of visiting unsafe or unreliable sites.

What if your system is affected?

There is still no proven solution but few means of escape which can minimize the damage.

- Immediately disconnect the infected system to stop further spreading.
- Try to backup essential files as soon as possible.
- It is advised to not pay the ransom as there is no guarantee that you will regain access even after paying the money.

Conclusion:

The above incidents are catapulting ransomware into a new era, one in which cybercriminals are realizing that smaller attacks can be replicated easily and carried out against much larger corporations while demanding larger ransom sums. While some victims are able to mitigate attacks and restore files or systems without paying ransoms, all it takes is a small percentage of attacks succeeding to produce substantial revenue – and incentive – for cybercriminals. Ransomware attacks pivot to target connected devices such as smart TVs and fitness trackers. The rate at which the Internet of Things is growing combined with the widely-reported insecurity of IoT devices provides a whole new frontier for ransomware operators.

References:

1. https://digitalguardian.com/blog/history-ransomware-attacks-biggest-and-worst-ransomware-attacks-all-time

2. https://www.tripwire.com/cyber-security/10-significant-ransomware-attacks-2017/

3. https://www.quora.com/What-is-a-ransomware-attack

 4. https://en.wikipedia.org/wiki/Ransomware

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