Computer Programming

Computer programming – process of writing a source code

Programming languages - set of rules that are necessary to write a source code.

Computer program – set of functions

The most popular programming languages today are python, java, javascript, c++, c#

Statement – single line of code that perform a specific task; (words, numbers, punctuations \_\_\_)

With programming we are giving directions to the computer

**Programming paradigms:**

1. Event-driven – not result, but events (visual basic)
2. Procedural – actions, step by step (Pascal, Cobol, Ada, Basic)
3. Object-oriented – objects and methods (C++, Java, visual basic)
4. Declarative - based on result (Prolog)

Commands – keywords, numbers

The programming language that uses just 0s and 1s is called a machine (low-level)

The programming language utilizing simple English words is called source (high level)

A program written in a high-level language must be interpreted into \_\_\_\_\_\_\_ before the computer will read and process it (*упр 6 стр3*)

A compiler/interpreter is a program that converts a high-level language into machine code.

A program written in one of high-level programming languages if often called a source program.

The program produced after the source program has been converted into machine code is referred to as an object program

*Было что-то про assemble ………………………………………………………………………………………….*

**Types of errors:**

1. Syntax error – grammar of the programming language
2. Logic error – errors in instructions
3. Runtime error – program doesn’t produce the result

Programming activities: planning, coding, testing, documenting (*это точно всё?)*

Class – group of objects

Object - unit of data

Instance – example, its like object however within specific realisation

Method – approach how to modify data (like instruction)

Message activates methods

Template – formula of blueprint (чертеж/план) for creating a class

Object-oriented programming – treat as a real-life object (*sdelat normalnoe predlozhenie*)

**Pillars of OOP:**

1. Encapsulation – break connection between objects
2. Inheritance – for using in future, avoid the repetitive coding work
3. Polymorphism – ability of object to take different forms
4. Abstraction – shows only necessary information (attributes)

Characteristics: reusability (inheritance), scalability (polymorphism), efficiency (abstraction, encapsulation)

*What do Abstraction and Encapsulation have in common? \_\_\_\_\_\_\_\_ OOP main idea\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

OOP is one of the main programming methodologies, which is based on the idea that a program is a cluster of object, each belonging to a certain class and the classes build up an inheritance hierarchy. *(можно ли короче)*

Private: data that can only be accessed within the class

Protected: data that can only be accessed within the class, and its subclasses

Public: data or functions (methods) which can be accessed outside the class

Explicitly – in a way that is clear and exact

*BENEFITS AND PITFALLS OF OOP \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

Java: platform independence + unattractive interface

Python: free and open-source + limitation to databases

Rube: time-efficient + less flexible (because has a strong adherence to standards)

Artificial learning -> Machine learning -> Deep learning

DL – neural networks, independently, analyse and make decisions = facial recognition

ML – automatically learn, machines learn from data, analyse data (limited scope, difficult) = speech recognition

AL-simulate humans (wide range of scope)

DL vs ML (definition/working mechanism/management)

DL: analysing the whole world; neural network; self-directed; millions (virtual assistant, facial recognition)

ML: trained by different datasets; automated algorithm; data analyse by analysists; 1000s (speech recognition, medical diagnosis)

Virtual Reality – simulating world/environment

Augmented Reality – real world with digital objects (blend of digital and real)

Pros and cons:

+ can be used for training, education - they require expensive hw and sw to create and use

+ in game industry - disconnecting from the real world

+ train for real-life situations

+ automate many task (especially routine

AI (artificial intelligence) – science that study how to simulate human being

What things can a machine program do with AI:

It should be able to mimic human and act in a human-like way

AI vs ML: AI broader concept, while ML is the most common application of AI (app-s: Spotify, Pandora, Apple Music)

In future AI will outperform humans in relatively simple tasks such as translating, driving car etc.

**AI advantages and disadvantages:**

+ efficiency, accuracy, cost-saving

~ high cost of creation, upgrade; making human lazy, unemployment, lacking out of the box thinking

**Game programming**

Game programming – process of creating video games

Genres: simulation (copy different activities from real life); strategy (focused on skillful thinking and planning to achieve victory); role-playing (players assume the roles of character); adventure; puzzle – DESCRIPTIONS!!!!!!!!!!!!!!!!

Components; art, characters, levels, audio, lighting, story

Languages: C++, Java, Unreal Engine, Unity 3D, Lu

**Robots**

**Types of robots:**

1. Virtual robots – don’t exist in real life, they are just programs
2. Rolling robots – have wheels, only flat areas
3. Stationary robots – stand at one place (not moving), has some settings
4. Autonomous robots – self-supporting
5. Walking robots – have legs, not only flat areas
6. Remote-control robots – guided by a person (drones)

Bot – a computer program that works automatically

Robot – computer-controlled machine that is programmed to move, manipulate objects, perform work

Robotics – science and study of robots

**Components of robots:**

1. Motor of some sort (actuator/driver) - ?????
2. Sensory system – gives the robot the information about its surroundings
3. Movable physical structure (end-effectors) – movable parts of robots
4. Power supply – any type of energy
5. Program – set of instructions (commands)
6. Computer “brain” (CPU) – control all of these elements

Advantages:

Efficiency – robots can work without needing a break and for a long time

Safety – robots can perform dangerous tasks

Flexibility – robots can be programmed to perform a variety of tasks

Cost-saving – do not require salaries ~

Disadvantages:

Job displacement

Maintenance and repair – robots require regular maintenance and repairs

Limited adaptability - robots are programmed to perform specific tasks, which can limit their usefulness in situations that require flexibility or creative problem-solving

The cost of purchasing and installing robots can be significant, making it difficult for small businesses to adopt them.