

MODULE 8. Computer Programming

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1.Computer programming and the activities it involves

Computer programming is a process of writing the source code.Computer programming includes programming paradigms, activities and programming languages.Procedure consists of commands, commands consist of words,numbers and punctuations,which depend on syntax of the language. We use a compiler or interpreter to translate the source code to machine one. Programming languages include a group of statements, the statements consist of words or symbols, that are defined by the syntax of the language.

2.Programming paradigms

- 1.**Event-driven.** It focuses on the events.
- 2.**Procedural.** It describes how to do something step by step (pascal,cobol,ada,basic,c#,fortran).
- 3.**Object-oriented.** We represent data as real objects, that are grouped in classes with methods that can modify a class state.
- 4.**Declarative.** It's the opposite of event-driven and It focuses on the result.

3.The types of programming languages

Programming languages are divided into high-level and low-level languages.

- 1.**High-level** languages use commands and words which are based on human language. Computer understand high-level instructions thanks to translation programs : compiler and interpreter.
- 2.**Low-level** (machine language), which works only with ones and zeroes.
Machine language was changed by assembly, assembler translates your assembly instructions into machine one.

4.Object-oriented programming

Object-oriented programming allows programmers to think of software development as if they work with real-life entities.

Object - it's a unit of data. **Instance** - just an example of an object. **Class** - group of objects as a single entity. With **methods** we can modify a class state.

Pluses of OOP: allows reuse code thanks to inheritance, scalability thanks to polymorphism, efficient thanks to encapsulation and abstraction.

Main principles:

1.Inheritance - mechanism of basing an object or class upon another object or class, retaining similar implementation.

2.Encapsulation is binding data and its related methods together within a class.

3.Abstraction hides unnecessary information and shows only essential attributes.

4.Thanks to **polymorphism** objects can take on different forms.

5.Programming languages in demand

1.Java. Pluses: its crossplatform, minus : unattractive interface.

2.Ruby. Pluses: it has strong adherence to syntax, minus: is not flexible.

3.Python. Pluses : it's an open source language with simple but powerful syntax, minus : it's hard to work with databases.

6.Artificial Intelligence,its usage, advantages and disadvantages

AI (or Artificial Intelligence) - it's a science, the main task is to simulate(mimic) human beings.

Advantages:

1.Increased Efficiency. AI can perform tasks faster and more accurately than humans

2.Improve decision-making. AI can analyze vast amounts of data and provide insights

3.AI save money for companies by automating certain tasks

4.

Disadvantages:

1.High costs of creation. AI needs hardware and software updates to meet the latest requirements.

2.Making humans lazy. Humans tend to get addicted to AI applications,because they can do the majority of the work.

3.Unemployment. AI may replace minimum qualified workers in certain industries.

4.No emotions. Machines cannot develop a bond with humans,while human connection makes a team.

5.Lack of out of the box thinking.Machines can perform those tasks which they are programmed to do.

Usage: smart home devices, self-driving cars and some online-games.

7.Machine learning and Deep learning

Machine and Deep learning are the sub branches of Artificial Intelligence.

Machine Learning - allows machines to train with datasets, uses automated algorithms in working mechanisms,all the algorithms are self-managed and self-directed for fetching and analyzing data(about thousands),example of ML - is speech recognition.

Deep Learning - it analysis the hierarchy of the real world,uses neural networks in working mechanisms,data is managed by analytics to evaluate different variables(about millions),example of DL - is face recognition.

8.The difference between Virtual reality and Augmented reality

Virtual reality - its artificial variant of the real world, while **Augmented reality** adds digital things(objects and sounds) to the real world.

9.Game programming, genres, components, programming languages

Game programming - is a process of creating a computer game.

Genres: vast, but the most popular of them are strategy, puzzle, adventure, horror games.

Components: art, characters, levels, audio, lighting and story.

Programming languages: C++, Unity 3D, Unreal Engine, Java.

10.Robots, consistent characteristics

Robots - is a computer-controlled machine, that is programmed to move, manipulate objects and perform specific tasks.

The most popular types are: walking robots (they have 4 or 6 legs and they can move), rolling robots (can move by rollers only at flat), stationary robots (they can't move, but they are performing tasks which require accuracy), virtual robots (they do not exist in our life, it's just part of the program block), autonomy robots (they are self-supported) and remote-control robots, which are controlled by people remotely.

11.Robotic system, main components

Robotic systems are machines or devices designed to perform a variety of tasks autonomously.

Main components:

1.Processing Unit acts as the "brain" of the robot.

2.Power Supply : electrical or solar power.

3.Sensors are used by robots to get information from the environment. For instance light, sound, temperature or distance sensors.

4.Program consists of instructions, that robot should do.

5.End-effectors - movable parts to interact with the environment.

6.Actuators allow robots to move.

12.Robotics, programming languages and approaches

Robotics - is a science of the study of robots. **Programming languages:** C/C++, Python, Java

13.Robotic systems, applications, benefits, challenges and threats.

Application and benefits:

1.Increased productivity: Robotic systems can work 24/7 without the need for breaks or rest.

2.Improved quality: Robotic systems can perform tasks with high precision and accuracy.

3.Reduced labor costs: Using robotic systems can help reduce labor costs by automating repetitive or dangerous tasks.

4.Improved safety: Robotic systems can be used to perform tasks that are dangerous or hazardous to humans

Treats:

1.Cybersecurity: Robotic systems become more vulnerable to cyber-attacks, which could compromise their functionality and lead to serious consequences.

2.Dependency: The increased use of robotic systems may lead to dependency on technology, which could have negative consequences if the technology fails or malfunctions.