Emotional Intelligence and Educational Robotics: The Development of the EI-EDUROBOT

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Robots & Classroom

- Educational Robotics (ER) is used in the classrooms and teachers from all levels of education utilize them to present novel topics to their students

- ER offers opportunities both to educators and children to study STEAM (Science, Technology, Engineering, Arts, Mathematics) fields and other subjects, such as literacy, through teamwork, problem-solving, and cultivating collaboration skills and critical thinking

- Researchers' interest is growing about the role of ICT in the modern school and particular in their contribution to the therapeutic interventions for students with special educational needs

Educational Robotics

- ER appeared in the 1980's (Logo)
- There are two categories of ER:
  - constructing and manipulating a robot
  - programming a robot to solve a problem & make decisions
- The pedagogical objectives of ER are based on two main arguments:
  - The first is based on the preparatory role of school education and concerns ER as a subject of study
  - derives from the pedagogical dimension of education and treats ER as a learning tool

Educational Robotics & Special Education

- ICT is a powerful toolkit for teachers. Research highlights the promising results of ICT use in special education and specifically people with Autism Spectrum Disorder deficiencies (ASD)

- People with ASD are unable to maintain eye contact with their teacher or peers

- A humanoid robot can offer a point of interaction for developing social skills

- It seems that interaction with a robot for a short period time (five sessions) can reduce stereotypical autistic behaviors
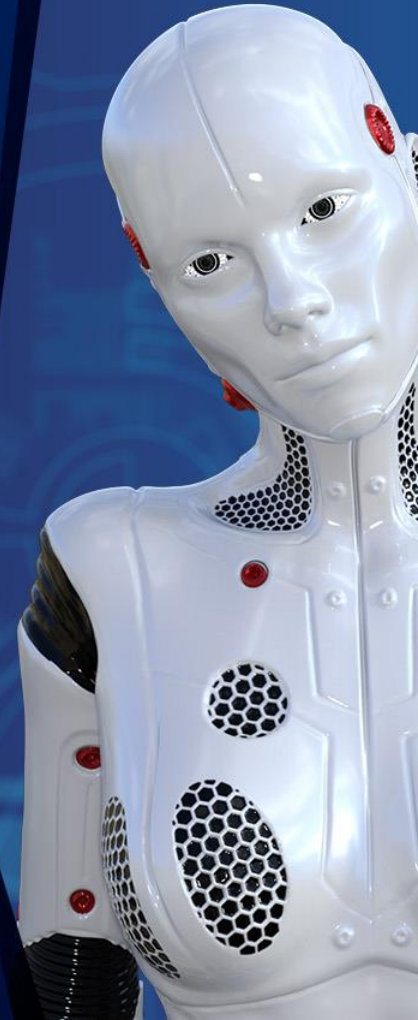
EI-EDUROBOT Platform

- The EI-EDUROBOT is an open-source training robot that can be used by both children aged 4 to 9 to learn by playing as well as older users, who can program and create their own scripts.

- The innovation of EI-EDUROBOT is that it can be used by children who have mainly autism spectrum disorders.

- In addition, the robot incorporates a mode that allows it to simulate the actions of an autistic child.

The EI-EDUROBOT educational platform consists of three main pillars:

i) hardware,

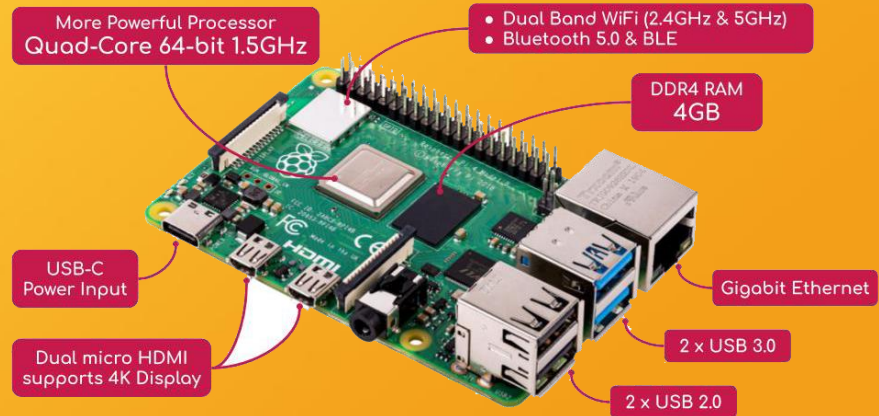*ii)* software, and

iii) the management platform – mobile app.

HARWARE

➤ Raspberry pi 4 model B (https://www.raspberrypi.org/)

➤ 7" touchscreen monitor and the screen resolution is 800 x 480 pixels

➤ Camera, speakers, microphone

➤ Has been printed in a 3D printer using NEEMA 3D PLA filaments

➤ Sensors:

    ➤ membrane potentiometer

    ➤ digital touch sensors

    ➤ IR Line Track Follower Sensor

    ➤ Ultrasonic sensors

- More Powerful Processor Quad-Core 64-bit 1.5GHz
- Dual Band WiFi (2.4GHz & 5GHz)
- Bluetooth 5.0 & BLE
- DDR4 RAM 4GB
- USB-C Power Input
- Dual micro HDMI supports 4K Display
- Gigabit Ethernet
- 2 x USB 3.0
- 2 x USB 2.0

SOFTWARE

➢ Raspberry pi is running a Linux based Operating System (OS), Raspbian

➢ Python

Management Platform – Mobile App

❑ The connection between the hardware and software has been established by a powerful web-based Management Platform (MP).

❑ The MP was developed by using Node.js

❑ The framework interface is user friendly and based on W3C standards: accessibility, usability, and inclusion

❑ Clear structure, easy navigation, simple forms, and it has a responsive and compatible design

❑ Through the MP the user can handle the robot

❑ MP is giving live access to the robot's camera and microphone

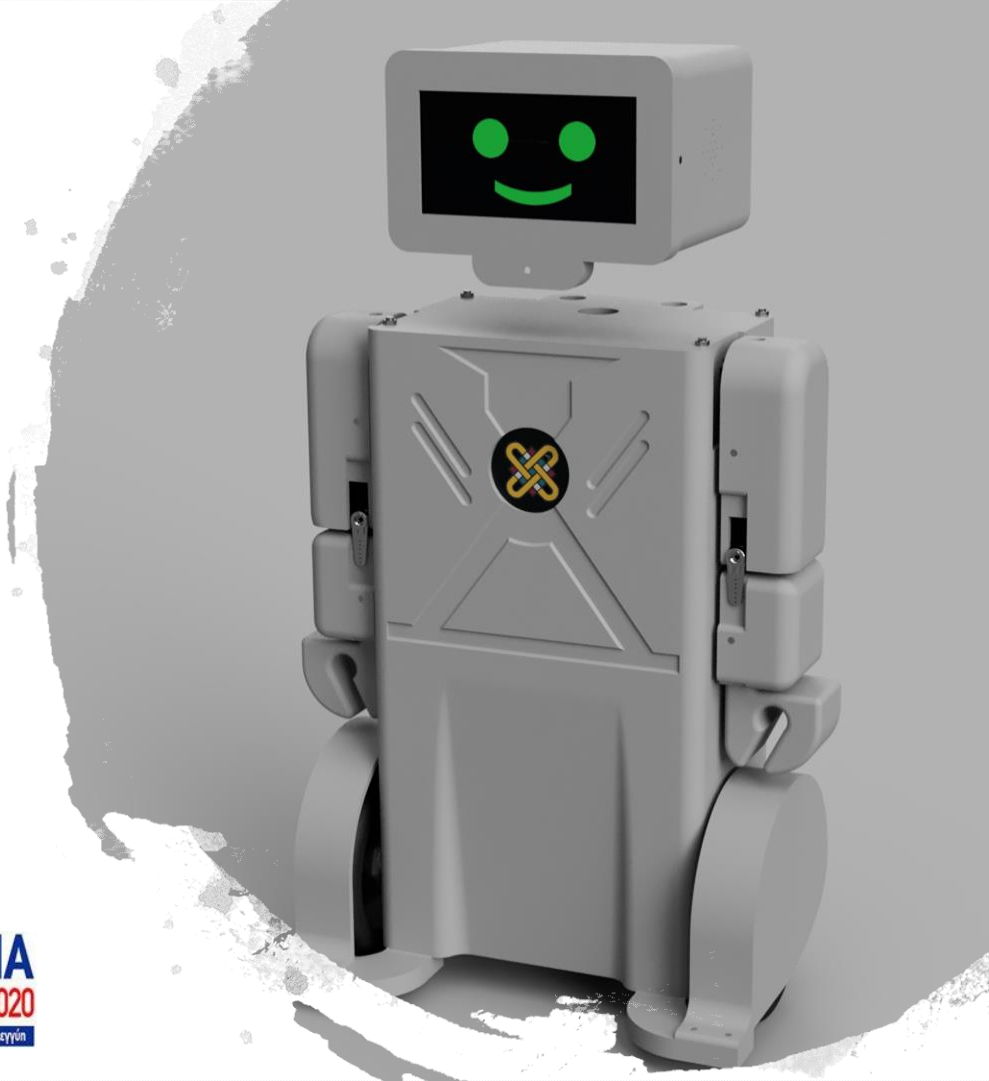❑ MP is completed by a mobile application

Discussion

- The EI-EDUROBOT has been designed to be used by children with ASD deficiencies to enhance their social skills, as it is programmed to interact as a human with them

- EI-EDUROBOT will likewise interact with children of typical development, simulating the behavior of a child with ASD deficiencies

- The EI-EDUROBOT aims to be a cost-efficient and easy to use

- The instructions for replicating and programing the EI-EDUROBOT will be freely available

- It is planned to develop a visual programming interface to further facilitate teachers with little or no programming experience to utilize the EI-EDUROBOT

Acknowledgment

Thank you !