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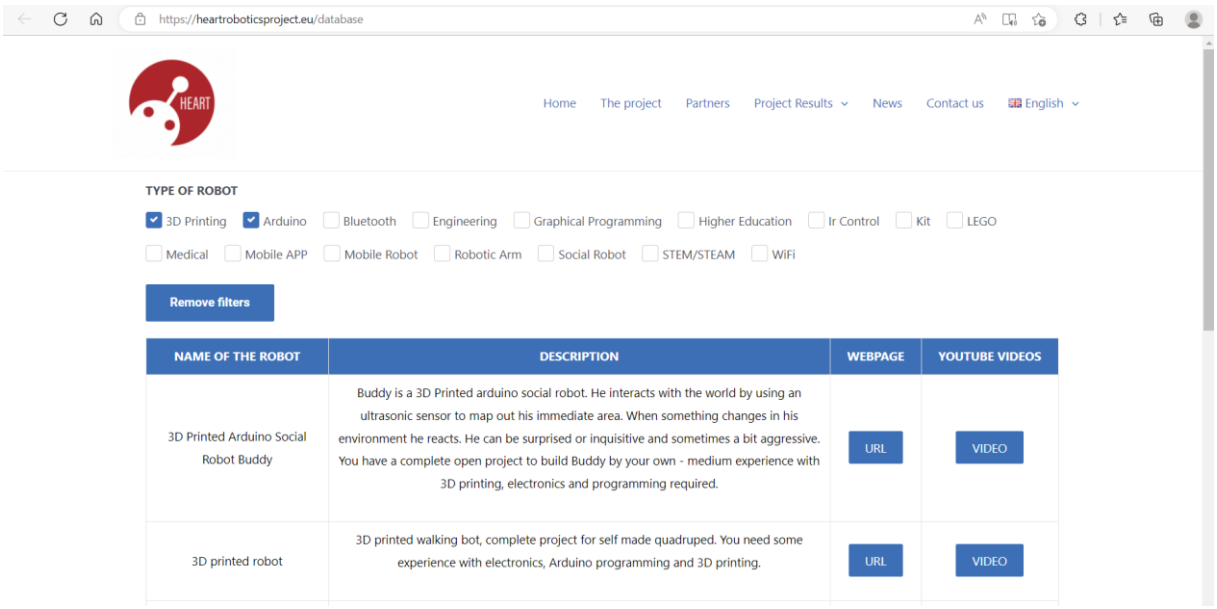
Education Guide

The following document contains an education guide on the use of our valuable resources: database and interviews with use cases of educational robots.

The Database of Educational Robots contains over 100 robots of different types and possible applications. In the default view you can browse all of them in alphabetical order. For your convenience we have provided 16 keywords to filter robots based on your needs. They are also listed in alphabetic order as follows:

3D Printing, Arduino, Bluetooth, Engineering, Graphical programming, Higher education, IR control, Kit, LEGO, Medical, Mobile APP, Mobile robot, Robotic arm, Social Robot, STEM/STEAM, WiFi.

By ticking any of the keywords, the database filters out only robots fulfilling all the chosen criteria, e.g. if you tick 3D Printing and Arduino, you will see only robots whose components are 3D printed AND their control system is based on Arduino compatible controller - you will find 7 robots of such kind. The more keywords you choose at once, the less robots you will find.



The keywords are clustered in 4 categories:

1. Construction: mobile robot (they can move on wheels, legs or tracks), robotic arm (used for manipulating the objects), kit – usually provides many possibilities to build variety of robots,
2. Application: medical, engineering, STEM/STEAM, higher education, social robot,
3. Communication: IR control, Bluetooth, WiFi,
4. Compatibility: LEGO, Arduino, graphical programming (e.g. Scratch based), mobile APP (usually provided by vendor or community).

Each record in the database contains the name of the robot, a link to the homepage (e.g. vendor, reseller, or community), a few sentences of description, and a link to the video showing the robot working. Apart from creating the database, we have conducted several interviews with experts (trainers and educators) working with educational robots – in order to give you use cases and additional hints.

Let us go shortly through the database and to Interviews, and further teaching material provided in the Training Course. You can find over 10 robots built with 3D printing technology – mostly offered as open source/ open hardware kits for self-preparation and assembly – you can build your education scenarios not only on robots sensu stricto, but also involving general engineering skills. You will find different levels of difficulty: from very simple projects e.g., Little Arm or LittleBots, medium difficulty e.g., 3D Printed Arduino Social Robot Buddy, Q1 lite 3, to advanced e.g., Aspir v2 or Poppy. We have also prepared an education module devoted to 3D printing – to make your experience with 3D printed robots even more enjoyable.

A large group of robots is designed specifically for teaching programming: ClickBot STEM, RoboMaster S1, Tello EDU, Edison, ELEGOO Smart Robot Car (even for beginners), Lego Mindstorms. Some are related to international competitions to further attract your learners (e.g., RoboMaster S1).

You will find robotic kits if you are interested in self-assembly – they inspire creative thinking and ideally fit the STEM/STEAM area of education. You have to tick the 'kit' keyword and see such examples: VEX IQ, Robotis Engineer Kit, Bioloid, Velleman KSR13, Lego Mindstorms. Some other use cases are available in the Interview files (e.g., mBOT from MakeBlock family). Another approach to make robots versatile is modularity (look for ClickBot), or connection to external Artificial Intelligence (e.g., Tello EDU, Moxi). You can find examples of DYI robots which can be self-made using 3D printing technology and Arduino prototyping.

There are several commercial social robots: EMYS, Furhat (also thoroughly described in the interview with prof. Olov Engwall), iPAL, Kebbi Air S, Kaspar, Maatje (some use cases can be found in the Interview 1 with Adult Educator from the Netherlands), NAO, Paro, Tessa. For instance the ZORA robot (one of the specialized applications implemented on NAO robot) - shown in an interview with an Adult Educator – designed to help nurses, childcare, and senior care workers.

You can find some more advanced robots based on the Robot Operating System – perfect for higher education and research. The TurtleBot3 Burger with open architecture of ROS can be applied almost anywhere – some educational suggestions are provided in the interview with Agnieszka Węgierska (PhD candidate and researcher).

You can browse through use cases provided by professionals in various disciplines showcasing their experiences with using robots for education. These interviews span across various applications, from using a robot designed by Prof. Engwall for speech training to using commercial Pepper social robot by Prof. Terzieva to determine the impact of lecture material on students, the degree of engagement in the classroom, and to see what provokes interest among the audience.

Mr. Kubat and Łuczak – both PhD students and researchers are using mBots to teach other educators from primary and secondary levels. They are involved in a large project aiming to increase the competences of teaching staff, i.e., people conducting extracurricular activities developing IT interests, as well as activating IT-talented youth, stimulating creativity and promoting team cooperation within IT clubs.

You can find examples of programmable mobile robots imitating animals or artificial intelligence. For example, Mireia Castellá, a clinical psychologist, presents several robots she uses in the Pere Mata Institute (Reus, Spain). Among them are: Cozmo, Bee-Bot, PLEAO-RB (robo-dinosaur), OZOBOT, and SPHERO-Bolt. Some of them can be found in the database, however, several are already obsolete – robotics is a very dynamic area.

Bee-Bot was also used by prof. Ona Ventura – a teacher and specialist in Learning Difficulties and Language Disorders.

More examples of using robots as social partners or educators can be found in the interviews with prof. Maria Georgantopoulou and Daniela Angelova: robot Edison, with Hristo Popov: robot Roberta, and with Anabel Lòpez: Robot Mouse.

Robots can also directly help disabled people – an interview with an Adult Educator in a university of applied sciences in the Netherlands presents the case of using Lea robot and more recently the Obi robotic arm to help people with motor problems with upper extremities.

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