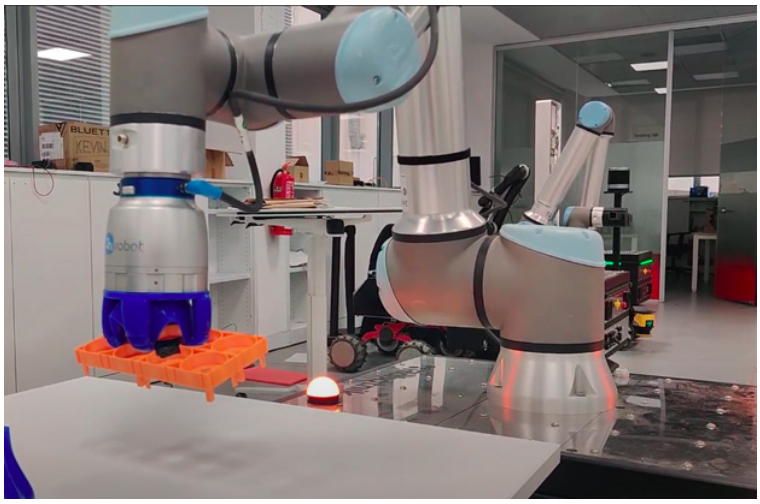
Trustworthy Hybrid-AI for flexible manipulation and navigation

Combining Mobility and Manipulation for Diverse Environments

(from https://robotnik.eu/)

Autonomous navigation of AMR (Autonomous Mobile Robots) and manipulation of robotic arms are advanced technologies that independently face significant challenges related to localization, path planning and accuracy. However, many industrial applications require integrated solutions that combine both capabilities: simultaneous navigation and manipulation. In other words, an Autonomous Mobile Manipulator robot.



Historically, robotic arms were used in industrial environments to perform repetitive or dangerous tasks such as welding or handling heavy loads. These robotic arms have a large manipulation capacity, but their working area is limited due to the fixed base. Because they were stationary and bulky, they operated within safety cells restricted to human operators for protection reasons.

As an alternative to heavy robotic arms, cobots emerge: more dynamic collaborative robotic arms that no longer need to be confined within safety perimeters but can safely collaborate with humans.

The result of this combination of a cobot and an AMR is an Autonomous Mobile Manipulator robot capable of performing manipulation tasks in different locations, such as moving objects between surfaces (Pick and Place).

ULTIMATE - ROBOTNIK

Robotnik participates in the ULTIMATE project as an end-user, providing a use case for the automation of a kitting process, that is the placing of several components with different sizes and shapes into an ordered set in a container, i.e. a kit.

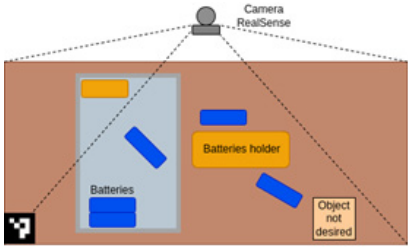
To execute this use case, Robotnik provides a RB-KAI-ROS+, the mobile manipulator robot that will execute advanced AI algorithms to detect and identify the components on the workbench, compute the order to pick the components and where to place them, find the best grasping pose and calculate and follow the arm trajectories to execute the different operations.

This is an interesting use case from the Industry 4.0 perspective, as it gives the opportunity to easily customize the creation of kits for different industries and areas, such as in-house logistics or package preparation.

In February 2024, a technical meeting was held at Robotnik's facilities. During this event, images were collected to create a dataset to train the AI and its algorithm. The dataset consisted of parts of a battery (cells, holders, and BMS) and other unwanted objects in various orientations and positions, both inside and outside a box. All of this was captured by a RealSense camera mounted on a tripod so that the entire table was in the field of view, as shown in the figure below.

Newsletter
#5
2025

The scenario consisted of a table and a box where the objects were placed. A marker was positioned on one side of the table to help the robot move to a point close to the table and access all the objects in the box. Another marker was placed in a corner of the table to assist the algorithm in calculating the object's position in the world, enabling the robot to locate the objects from its position. The RealSense camera attached to the table was connected to a mini-PC, allowing it to communicate with the robot and the algorithm via WiFi.



On the other hand, Robotnik has continued to work on pick and place methods, testing new gripper tools. OnRobot's SoftGripper provides the ability to pick objects with irregular shapes, such as battery cells or battery holders. By combining different tools on the same arm, the robot is able to lift any shape. In the image below, we can observe that the arm is picking the battery holder, which shape was difficult to lift with vacuum grippers.

18-19
February 2025
Sparks Meeting, Hybrid event

On the 18th of February, from 10:30 to 12:00, the Trustworthy AI Cluster partners were @The Future Ready ADRA Event.

The AI Data Robotics Association promotes the Future-Ready: On Demand Solutions with AI, Data, and Robotics event.

- Michel Barreteau - ULTIMATE
- Stylianos Trevlakis - TALON
- Jaume Abella - SAFEXPLAIN
- Nikos Katzouris - EVENFLOW

discuss and share the current and promising results about Trust**worthy AI of the sibling projects and proposing new challenges to be addressed for a better acceptance of AI solutions within the industrial domain.**

This newsletter is not formatted for paper printing. Preserve the environment and only print this page if necessary.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.