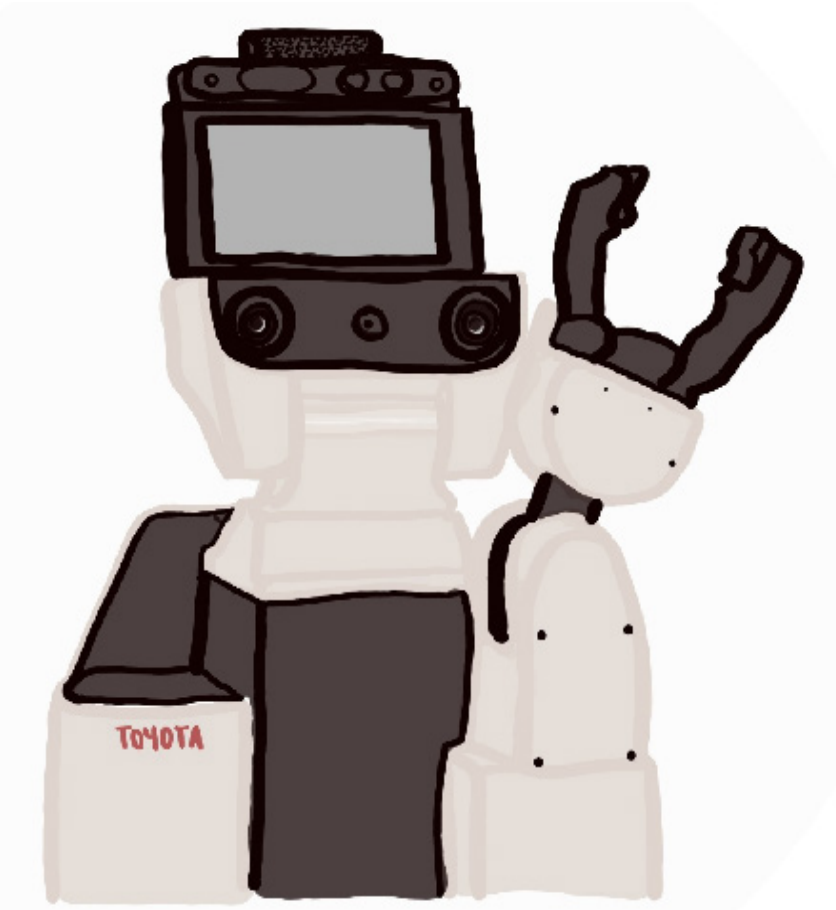# AI 4 Everyone @Home

Education Festival
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VIP — VERTICALLY INTEGRATED PROJECTS

PURPOSE

With an aging population, the support needs of our country are every growing. In the @Home team of AI 4 Everyone we aim to develop service and assistive robot technology with high relevance for future domestic applications.

SOME OF THE TOOLS WE USE

YOLOv8: Our robot processes all the information from the depth camera through a vision pipeline, part of which uses YOLO. YOLO is a object detection system, given an image it can detect the objects within. For humans, it can then place a skeleton on them, we use this to find where they are looking or pointing. YOLOv8 comes pretrained on the COCO dataset, but for the Robocup we have to train it further using machine learning (this year we were tasked to train it to detect waffles).


Rosnav: When our robot has to go somewhere we have the global goal (the destination) and the local goal (our next incremental movement). Rosnav is the set of packages our robot uses to determine how to make local goals to get to the global goal. It uses the vision to determine objects in the path and can use maps for further planning. Here we can see it detect a chair.
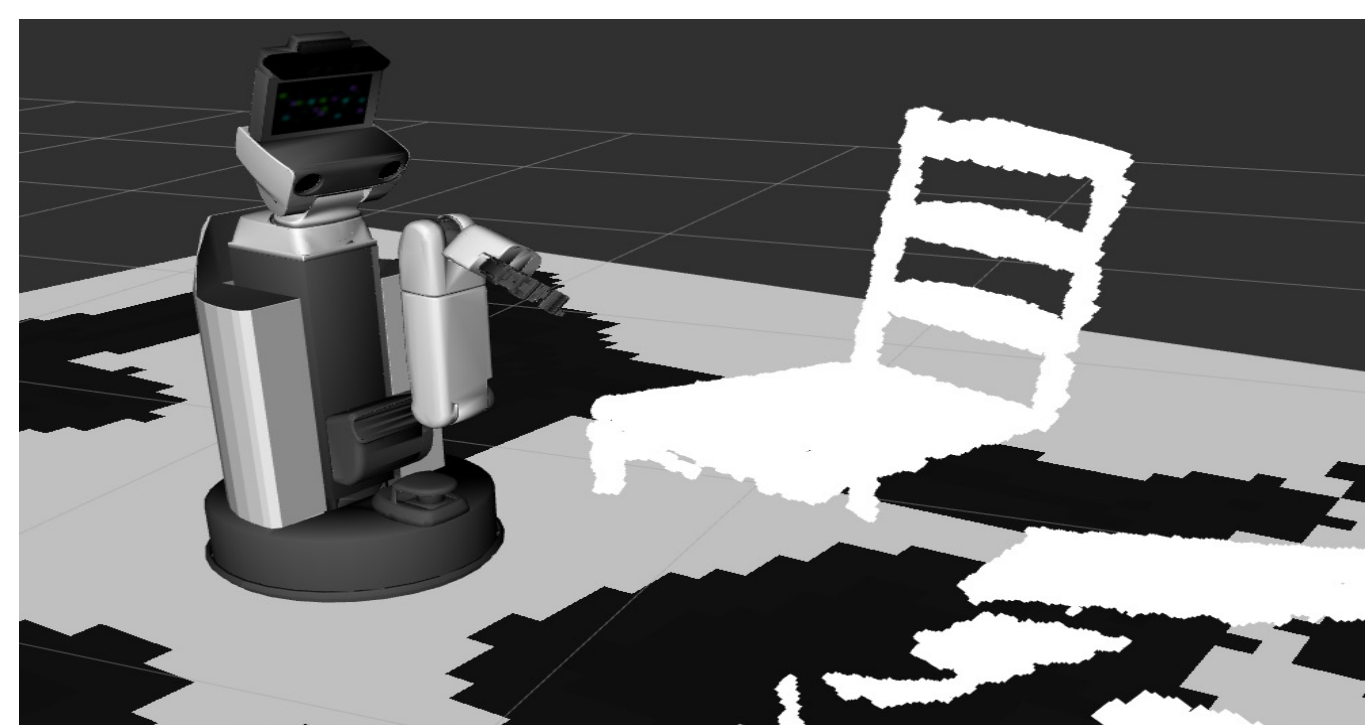
Programming with a purpose

Blinky the robot
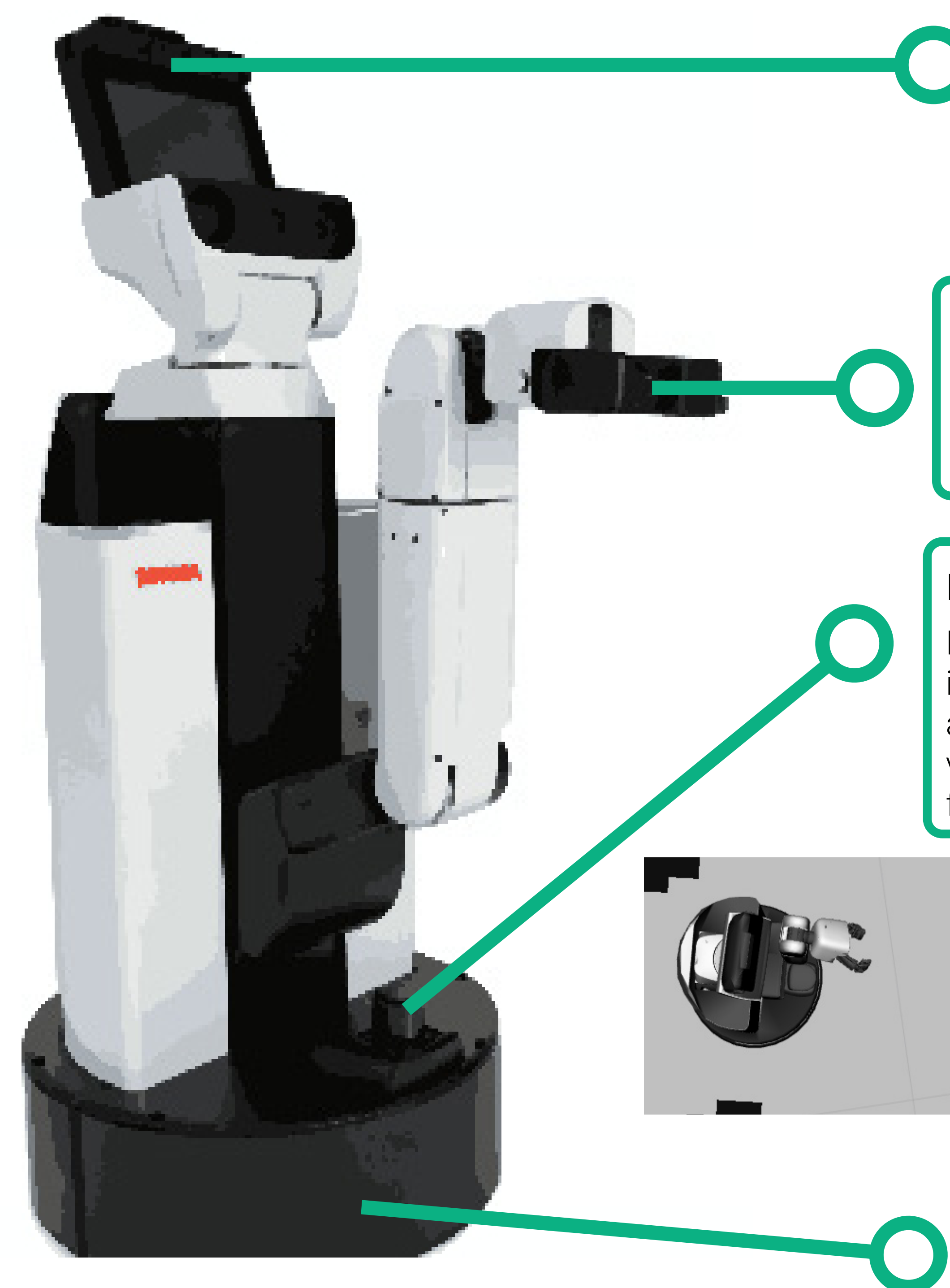
KINECT
On the top of Blinky's head there is a depth camera, it can provide depth information for every pixel in the images it captures.

GRIPPER
Blinky uses a gripper to pick up objects, we can close and open the gripper using commands, detect pressure in the gripper, and there is a camera

LIDAR
Blinky uses a LIDAR system to detect his immediate surroundings, it emmits 1000 lasers at the same height accross a 240-degree field of view in front of him. He can detect the distance for each of these, below is the scan of a chair.
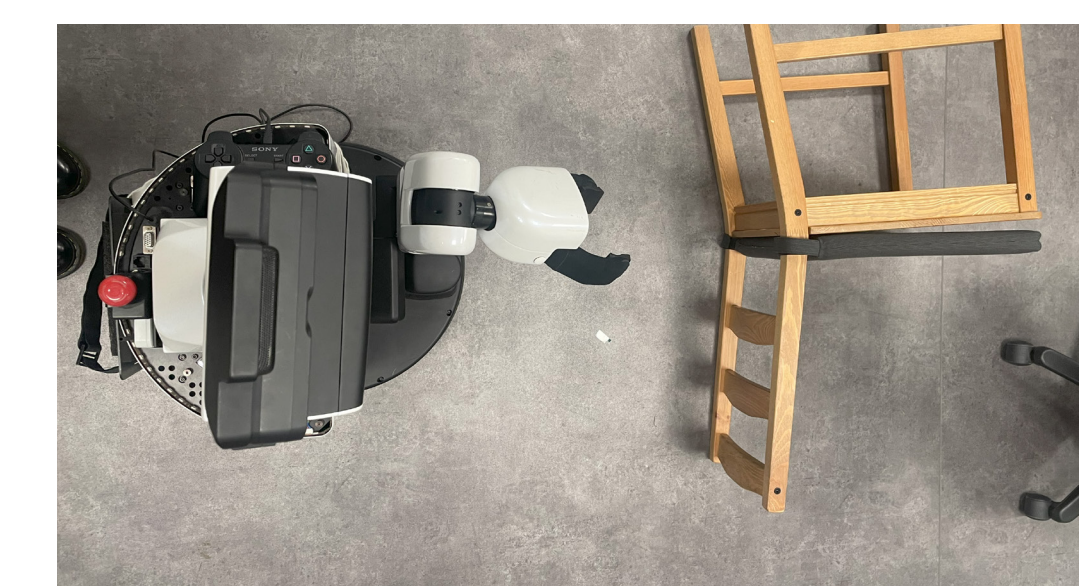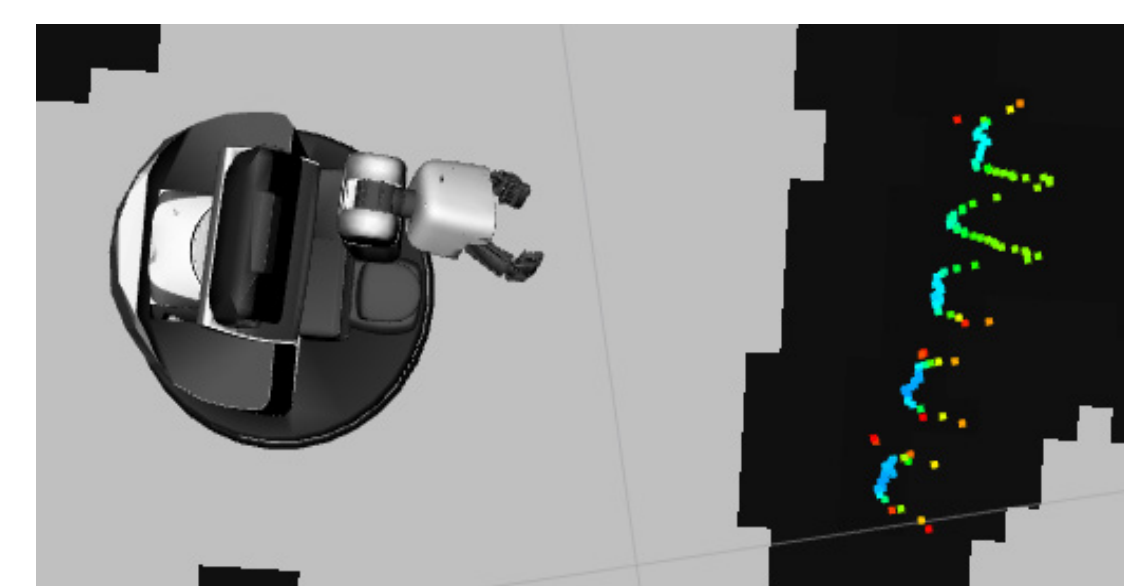
OMNIBASE
Blinky sits on an omnibase (it looks like a roomba) that can move in all directions, turn, the lot, except going up steps.

ROBOCUP

Robocup is an international robotics competition held annually. For Robocup 2024, held in the Netherlands, there were over 2000 participants forming 300 teams representing 45 countries.

We compete in the @Home League of Robocup. In this league, teams are challenged to make our robots complete household tasks autonomously. Some of tasks from this year's Robocup included:

- Carry my luggage: In this task our robot must be able to identify a bag being pointed at by a person, pick it up, follow the person to a location, and return back to it's initial location.

- General Purpose Service Robot: In this task our robot must be able to identify commands such as 'Give me a bottle of milk from the kitchen', then independently decipher and complete them.

Within the @Home league, we compete in the Domestic Standard Platform subleague. All of the teams in this division work with the same robot, the Toyota Human Support Robot (HSR). Although we are limited to only modifying the software of our robot, the complexity of our tasks are still enormous and very exciting.

Future

Next year we will be competing at Robocup 2025 held in Salvador, Brazil. Although alot of the overall tasks are repeated, many of the internal variables are changed, these can include house hold objects and furniture, food items and names. There's still alot for us to develop and polish. If you join you can expect to try some YOLO training, help develop our NLP, and alot of programming with ROS.