

ChatGPT was implemented for **HERA**'s speech recognition to achieve major interaction.

We use a **ZED2i** camera for the **vision system** to assist with the manipulation.

Our team built the **manipulator** to ease the movements and provide greater freedom for repairs and improvements.

Using **topological optimization**, we improved **HERA**'s structure using aluminum and steel, as well as lighter materials such as carbon fiber and MDF.

HERA has an **omnidirectional** base, which eases movement and helps with quick position corrections.

MEET ROBOFEI

The team **RoboFEI@Home** has existed since 2015 and has always been involved on the Robocup committees since our members are volunteers for the league: as OCs, TCs, and a Trustee. Constantly searching for stimulating the category in Latin America, the team participates and helps to organize the competition.

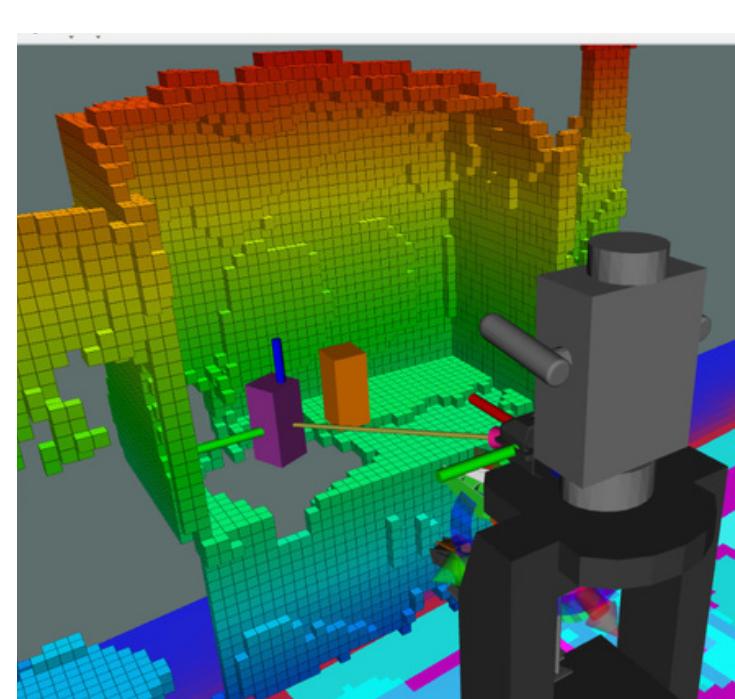
MEET HERA

HERA (Home Environment Robot Assistant) is a service robot developed by the **RoboFEI@Home** team at **FEI University Center**, designed to perform human-robot interaction and cooperation tasks.

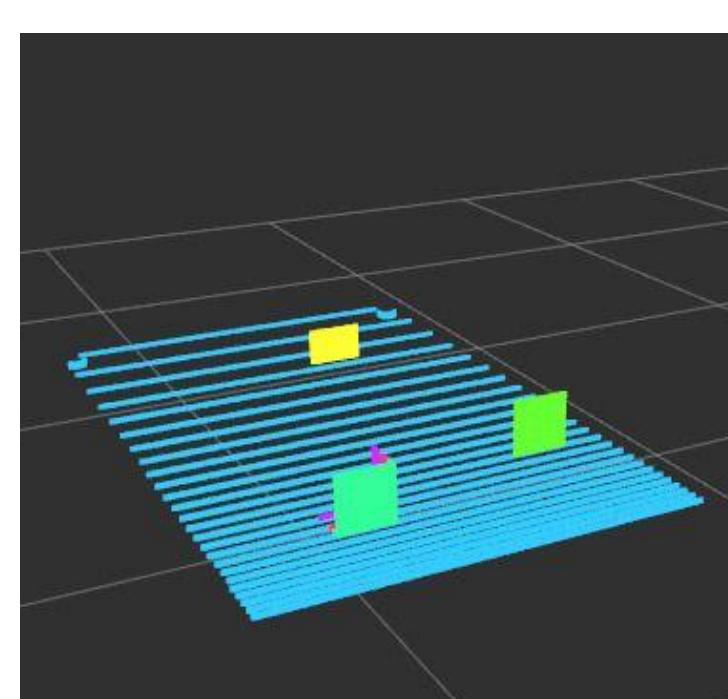
SCIENTIFIC RESEARCH

HERA executes a modeling procedure for its Human-Robot interaction. This model procedure is a **scientific research** that aims to control and tidy up algorithms of interaction used for tasks. That is developed by a flowchart that follows a step-by-step of possible situations. This theoretical study helps to create algorithms with many variables, allowing a vast point of view.

The **manipulator** uses a **scientific study** to optimize the manipulation process, using a point cloud to detect which objects can or cannot be manipulated. And search for the best way to do that, together with a "motion plan" that calculates the **best trajectory** to manipulate the object safely and efficiently.



Img. 1: Point Cloud mapping possible collision and objects.



Img. 2: Checking graspable objects.

The electrical study involves creating an **intelligent system** to develop **battery management**. Using a database, we will calculate the current consumed and return the most effective battery to the process: lithium, lithium-ion, and lead-acid batteries.

TOPOLOGICAL OPTIMIZATION

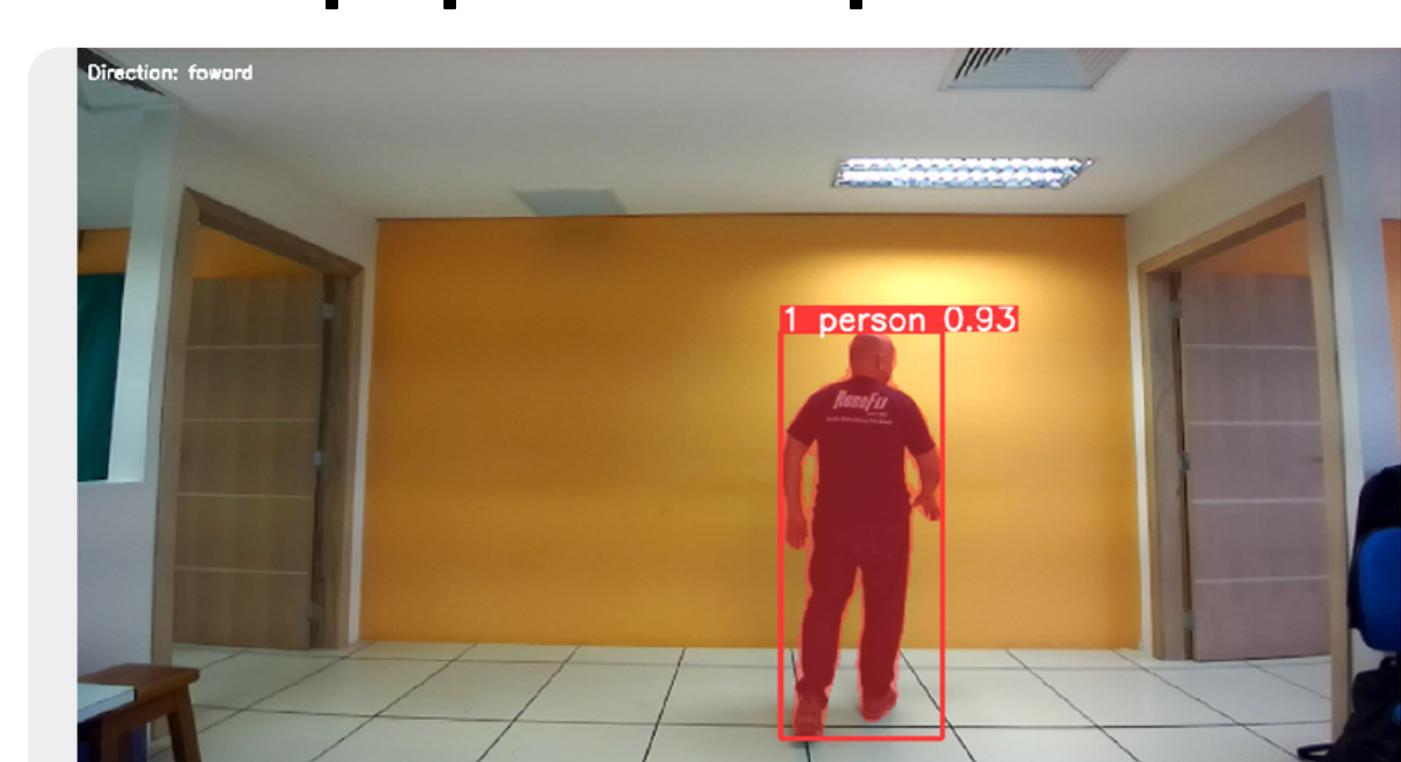
The team has been working on the mechanics department on a **topological optimization**, in which there is a weight reduction with no change in characteristics and appearance. So it is now possible to carry more weight and move faster.

VISION ALGORITHMIC ADVANCEMENTS

Our software team constantly develops new algorithms and improvements for our tasks. This year, we implemented a **face recognition system** using DLIB and a database to keep track of whom we interact with.

For our **object recognition**, **YOLOv8** is applied since it is the most advanced segmentation model for custom datasets.

For **HERA**'s follow interactions, people are detected and tracked through a learning system with the help of a **reidentification process**. A risk value is calculated based on the person's position, allowing the robot to adjust its orientation and speed to keep up with the person.



Img. 3: Following test. Shows a person moving forward and the identification of the movement.