HumaBot Challenge

In the HumaBot Challenge, the robot is an integral part of the house and helps its occupants to live there better. In this edition, several tests will be held in the kitchen of the house.

The tests

There are two mandatory tests (1, 2), while the third test can be chosen. A technical file must be submitted for each test.

1. Put off the fire: the robot must check which kitchen fire is lit, and put it off by pressing the corresponding button.
2. Shopping list: the robot must recognize which products (from a pre-defined set) are available on the shelves, and which other products are missing, and make a shopping-list.
3. One of these possibilities:
    a. Meal preparation: the robot must grasp a tomato and put it into a cooking pan.
    b. Climbing stairs: the robot must detect and climb or descend each step (steps can have different height).

Scores

Each test will be graded over 20 points. Grading will be performed on the day of the finals according to the robot's behaviour in the real room and not in a simulation. Each team will have the right to two attempts per test, lasting 3 minutes each. The best grade of the two attempts will be retained as the score. On the day of the finals and for each of the tests, a bonus will be awarded based on the success and speed of the task, and a penalty will be issued if the team must intervene on the robot during its attempt.

Rules and technical information

Programming and navigation techniques

The choice of method and programming languages are left to the teams. Human intervention is prohibited, but connection to the robot via Wi-Fi is allowed, as well as non-embedded applications. It is thus possible to program the robot with any compatible methods. The code must nevertheless be presented to the jury, without any restriction. Orientation marks can be used for navigation and object recognition, as well as any other system to guide the robot around the environment.

Start of the tests

Each of the tests will be performed independently, that is to say, the robot will leave its base for each test and will stop after completing the requested task without returning to its base location at the end of the test. For each test, teams will place the robot at its starting location before the beginning of the attempt before the jury.

The robot’s starting location is in the middle of the kitchen area, sitting on the floor, facing to the kitchen, with the table at its right.

Navigation

Navigation is a prerequisite for each test. Indeed, the robot must start out from its base location and go to the items with which it must interact. The choice of the technique used by the robot to orient himself in the room is totally free. Orientation marks will be placed on some surfaces (cupboard, table). Teams are free to add some, whatever the type, before the start of the test.

The robot is allowed to fall, but must get up and start to move again on its own. Any human intervention in the room during the test will result in a penalty being applied to the results of this test.

The environment

The robot is located in a kitchen corner, consisting of a kitchen module and a table.

The dimensions of the walking area are 85 cm (width) and 90 cm (length). Besides the furniture, this area is surrounded by walls of 45 cm height. The kitchen floor consists of a wooden platform, elevated from the ground, in order to facilitate the manipulation of the objects on the working surfaces (kitchen and table).

QR codes are located in the furniture for detection and localization purposes.

The kitchen

The kitchen consists of two lower cupboards, a working surface in the middle, and a higher shelf with a microwave oven.

Each cupboard opens to the left and right, respectively. The doors are 31 cm wide and 32 cm high.

The left door is partly transparent. This door will start open (between 30 and 45 degrees) to allow the robot to move it further and look for objects inside the cupboard. The right door is completely opaque and it will remain closed. A QR code is fixed on this door.

The fire

In the kitchen working surface there is a panel with two independent electric fires. Each of them consists of a small circle of radius 2 cm and a ring (inner radius 1.8 cm, outer radius 2.5 cm). The distance from the center of the inner circle of the bottom fire to the one of the top fire is 13 cm.

The fires are operated by two big switches located in the middle of the surface. Each switch is 2.5 cm wide and 5 cm long, and it is located 3 cm above the surface. To the right of the working surface there is a water faucet and a sink, which are not used in the proposed challenges.

The table

The table surface is 63.5 cm wide, 48.5 cm deep, and it is located 34 cm above the floor. A QR code is located to the right side of the table. The cooking pan is located to the left side, and the tomato is located between them.

The shelves

There is one shelf in the upper kitchen module. A microwave oven is in the middle of the shelf, and there are two empty spaces (16 cm wide) at the left and right sides respectively.
The upper shelf is 32 cm above the working surface.

There are two shelves in the left cupboard of the lower kitchen module. Each shelf is 30 cm wide, and they are located 0.5 and 15.5 cm above the floor respectively.

The objects

In the shopping-list test, the robot is asked to inspect the shelves and tell the user a list of the missing objects, from the following pre-defined set:

 bouillon cubes	 clove	 coffee
 muesli	 popcorn	 tea