A screen shot of a computer

Description automatically generated

In order to evaluate ground truth, it is necessary to have a real-life tracking of robot position in order to compare it with the map generated by the exploration of the robot by using the different methods.

To do so, it is required to find certain features of the robot, which in this test were blue, so it could differentiate from the rest of the map. A region of interest was selected to detect those features.

A screenshot of a computer

Description automatically generated

With the help of tracking bars, the region of interest started becoming black, leaving only what it is required with colour, by using a range-filter Detector in the HSV colour space (cite).

A screenshot of a cell phone

Description automatically generated

Using OpenCV in python, it is possible to get an aerial perspective of any image that we take. That’s how by using the function “getPerspectiveTransform” it was possible to get a 25x25 grid of the map to qualitative compare it with the one obtained by the robot and providing several possible cells to visit based on where obstacles are being detected.

Detection of obstacles in the grid image is made by using a line detector with the use of canny filter to isolate the contours and a hough lines detector to define them.

Finally, this number is used to make a quantitative analysis of robot’s movement.

A picture containing clock, object

Description automatically generated

By using the same perspective transform, each frame of a video was processed so the tracking could be performed only under the map in an aerial perspective.

Based on the colour of the Romi, a tracker was performed finding a region with radius of more than 5 pixels and less than 10, so noise couldn’t get in the middle, then, a blue circle was painted in the image, moving where the robot moved, creating the blue lines seen in the Result images representing the whole path of the robot.

Having this is possible to get the real position and compare it with the map that robot obtained after the exploration algorithm where it had to cover as much as possible from a given unknown map.

Same as the number of empty cells provided with the base map, after the robot’s movement, a new image is created with the marked lines, giving an output of the number of visited cells by the robot. With this is possible to make a quantitative analysis of the real visited cells vs the virtual map created by the robot.