Project 2 Report
Behavior-Based Object Clearance Robot

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Objective:

To design a behavior-based object finding and removal robot that is able to move from an unknown position in an indoor environment to look for an object, raise an alarm, and push the object off its location on the floor.

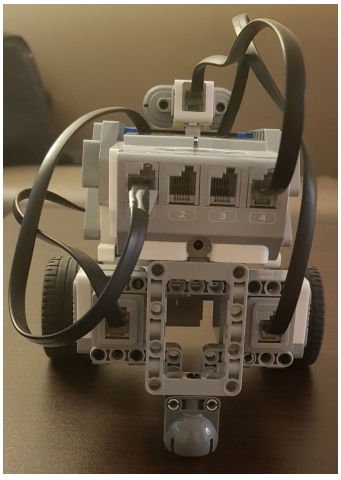
Workspace:

The environment is a closed indoor space separated by randomly placed walls. The robot is placed in an unknown location within this environment

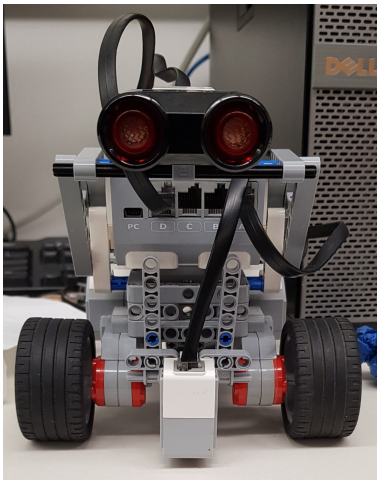
Robot Design:

We designed a three-wheeled robot. The front of our robot has two front wheels attached to the motors and in the back, we have a smaller wheel that allows our robot to make turns. We made a base to be able to mount the EV3 high enough off the ground and away from the wheels.

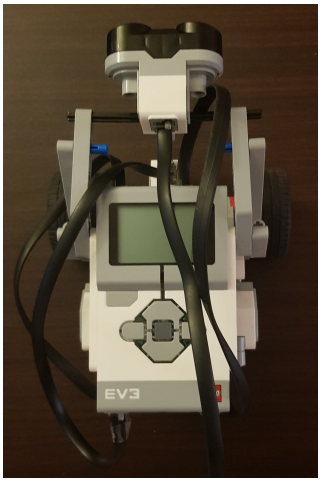
We used two types of sensors - a light sensor and an ultrasonic sensor. The light sensor is used to detect the wall (blue tape) and the goal area (red tape), and the ultrasonic sensor is used to detect if the can is within 1 foot of the robot.



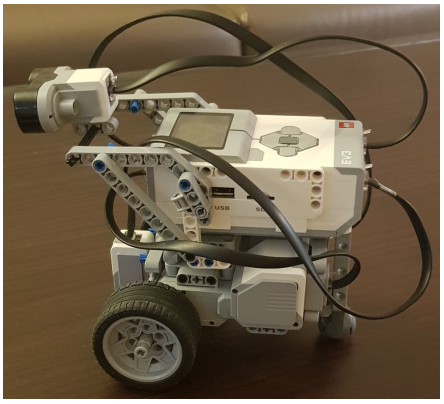
Back View

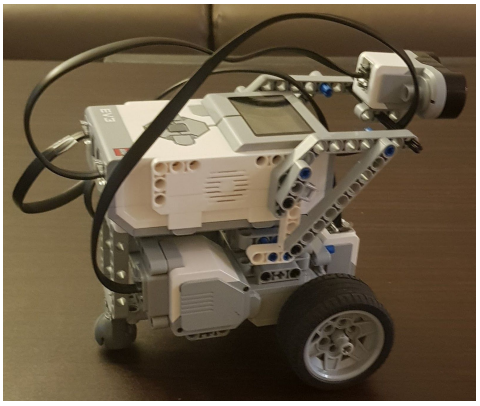


Front View



Top View





Side Views

Behavior-Model:

The robot follows many behaviors to accomplish its tasks. Below is the description of each behavior:

1) Wander - Chooses a random action of turning left, turning right, or moving forward. If the robot encounters a wall before going into the wander function, then the robot will either turn left or right.
2) Wall Following - This is the way we have the EV3 robot to travel throughout the course. If the robot detects RED it will use Goal_finding to move the can out of the area. If BLUE is detected it will back away from the wall and then will go into the start to wander again through the course.
3) Move Away From Wall - The robot will move away from the wall once a wall is detected (blue is detected).

Challenges Faced:

We faced quite a lot of challenges. In the beginning, we faced some trouble with the light sensor to detect blue. We solved this problem by shifting the light sensor closer to the ground.

The second problem we faced was overturning. Our right and left turns were based on the outer wheel making the turn. This led to the entire robot turning over the wall. We changed this behavior by making the turns by the center of the robot. This took some experimentation with different functions available in EV3, but we found the function and the configuration that best worked for our robot.

The third problem we faced was making sure our detection had time to implement its code before the robot moved to perform the next action. We fixed this problem by adding Wait() statements and by trial and error.

Goal Detection:

Once the robot detects the goal area (red tape) and the ultrasonic sensor detects that the can is about 1 foot away, the robot performs the “clearing” behavior by starting an alarm, moving forward, and pushing the can off the goal area. This behavior is demonstrated in the video.

The Code:

Attached to the submission is the code for the robot.