University of Texas at Arlington

# Project #2: Behavior-Based Fire Alarm Robot Project Report

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# Robot Specification

The robot has a collection of motors and sensors to accomplish the behavior system. For movements and rotations, the robot has two large motors. Additionally, the robot has an ultrasonic sensor on the right side to detect and follow a wall and two touch sensors at the front of the robot to detect a collision. Finally, the robot has a color sensor to detect the possible fire source and a medium motor that controls a fan to blow out the fire.
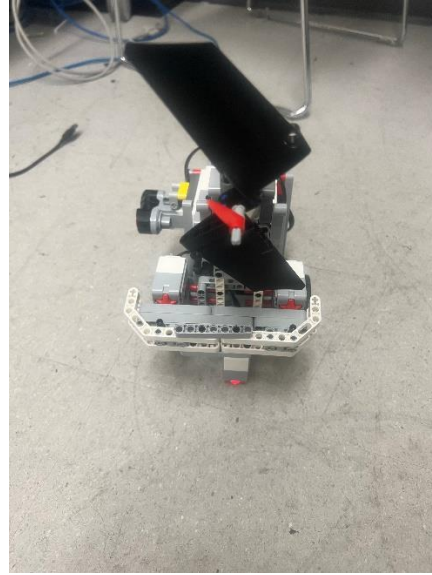
## Behavior Implementation

Our robot has several behavior modules/scenarios that can occur throughout the course. These behaviors include wander, wall following, goal finding and identification, extinguish fire, and collision. Each of these behaviors has different priorities set by where the condition is being read.

To start, the wander algorithm is the lowest priority behavior module that simply performs a random search which includes the following actions: moving forward, turning left, and moving forward, or turning right and moving forward. Each action also checks to see if any higher-priority modules are about to occur based on the conditions.

The next algorithm and second lowest priority behavior module is the wall following algorithm. This behavior occurs when the ultrasonic sensor has detected a distance of at most 10 cm. If the robot gets too close or to far from the wall, it will either move away or move closer to the robot based on a set speed. If the robot has been following the wall for a certain period of time, the robot will move away from the wall and call the wander to begin another search. This is implemented to prevent the robot from looping around the course.

The third and fourth lowest priority behavior is the goal finding and identification and fire extinguisher. This is called when the color sensor has detected the right color tile chosen that determines the possible fire source. After the goal has been identified and found, it will then call the extinguish fire protocol, which simply turns on the medium motor that controls a fan.

Finally, throughout the environment, the robot might collide with a wall or corner, so the wall collision behavior protocol. This algorithm simply moves backward for a brief period and then chooses a direction to go based on what the previous behavior algorithm was.

## Challenges

Throughout the process of the project, we found that the robot would tend to get stuck in certain corners of the environment. The problem was solved by adjusting the time in which each action was performed, whether that was moving away from the wall or moving towards the wall. Additionally, there was also an issue where the robot would stop following the wall despite the distance being relatively close. This issue was fixed by including a separate moving function for wall-following purposes which allows the robot to move at a short distance to keep the range of detection closer to the threshold.

## Code

The code for the robot is attached separately to this compressed project folder.