CSE-4360/5364

AUTONOMOUS ROBOTS

Project 2- Fall 2018

Behavior-based Fire Alarm Robot.

TEAM: DEXTER (GROUP 7)

Team members:

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CSE-5364 ROBOTICS TEAM: DEXTER

OBJECTIVE: To design a behavior-based fire detection robot that is able to move from an unknown position in an in-door environment to look for a fire, raise an alarm, and extinguish it.

WORKSPACE: The walls of the rooms are approximately 15cm high and the fire location is indicated by a burning candle (in a glass candle holder) on top of a differently colored area the size of half a floor tile. There are no door openings to the outside of the house.

DESIGN: We built the robot using the Lego EV3 Robot kit with four sensors which are Gyro sensor, Ultrasonic sensor, Touch sensor and color sensor.

Wall following strategy –

We have implemented counter-clockwise wall following strategy i.e. we controlled the motion of the robot to follow the wall on the right side of the robot by keeping the distance 7 to 9 cm from the wall using ultrasonic sensor. We used Gyroscope to align the robot in parallel to the wall to eschew the robot drifting away from the wall. We used touch sensor to detect any wall right in front of the robot. Once it hits the wall it will turn left with the help of the Gyroscope to achieve exact 90-degree rotation. If the detected distance on the right-hand side of the robot exceeds 25 cm, it will turn right. After ensuring that the robot is within the allowed distance, routine will adjust the orientation of the robot. There is no competency between distance adjustment and orientation adjustment as both routines takes turns one after another. If the robot is placed at any arbitrary position away from the wall then it will follow straight path until it hits the wall after which it switches to the wall following routine. Least priority is assigned to wall following activity.

Obstacle/Wall detection:

Obstacle detection has the highest priority i.e. it frequently checks the output of touch sensor to ensure obstacle/wall is detected as soon as possible.

Goal Detection:

Color sensor is used to detect the Goal i.e. candle, which is placed on a tile which differs in color than rest of the workspace. When goal is detected it triggers sound alarm & immediately activates fire extinguishing mechanism. Priority of this task is lower than obstacle detection.
To extinguish fire, robot hits a flap repeatedly on the top of the candle. Goal detection routine is called frequently within the code after each instance of obstacle detection check.

Source code is attached with report.