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IT 209 – Introduction to Robotics

Southern New Hampshire University

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Final Product

Project Proposal

Description of Problem

Through the robot I will be able to understand where and when does sunlight shine into our living room. This will help us to understand when does our automatic lights need to come on for us in the morning and in the evening. In addition, it will guide us in what is the best location for our plants to stay.

Prototyping Goals

The two sensors on the robot that I will be using will be the light sensors and the temperature sensor. The light sensors will be used to keep track of the movement of light because when an area becomes dark the light sensors will trigger the Finch to move to an area that is brighter. In addition, the temperature sensor will be used to get a more accurate reading of the brightest and hottest area of sunlight, the sensor will finer tune its movements.

Originality

This type of solution using a robot differs from automated solutions in that it moves and uses 2 sensors to influence the movement of the robot. In an automated solution, it was just be sensors that are place around the room sensing the movement of light in the room and then feeding that data into a document. An automated system, can also be used to trigger other events, like to turn on the lights, but it is just responding. While a robotic solution moves along the path of the sun it could trace a visible line and record timestamps, by this way I am able to better understand what is happening.

New Trends

This type of solution follows with new trends of robots because it is using multiple sensors to influence the way that the robot moves. For example, iRobot makes robot that use multiple sensors to vacuum, mop, and mow the lawn, and this is all down by sensing its surroundings to influence its movements (iRobot, n.d.).

Analysis

There are 3 robot applications that will be looked at to see the similarities and differences between the application that was written for the Finch robot and ones that are used in many areas in society. First, is the law enforcement and emergency response application that navigate an area and use its sensors to understand the situation that is being given to it and make important decisions. Both applications use sensors to help them to navigate and they respond to data that it gets from its sensors, but with the law enforcement and emergency response application it can be controlled remotely but it can also work autonomously. Second, is the construction application that can assist in the construction of building, but it can also do the construction itself. Both of them are able to use sensors to know where and how to move and to follow a programmed routine, but for the construction robot it is able to preform multiple actions at once, but it is limited to movement to a track while the Finch can roll around. Third, is a military application that can assist soldiers in their missions for information gathering, clearing debris, and protection. Both of them are able to sense their area to complete a set of programs and give responses to what it senses, but with a military application it is able to work with other robots to complete a goal and it is able work autonomously to work closely with people. These 3 applications were found on The Robot Report (Matthews, 2019).

Prototype

A screenshot of a computer screen

Description automatically generated

Software Design

Pseudocode

while loop;

temp1 = temperature sensor

if((rightLight – leftLight) > 5)

Finch light yellow

Turn left slowly

else if((leftLight – rightLight) > 5)

Finch light green

Turn right slowly

else if (((leftLight – rightLight) < 5) or ((rightLight – leftLight) > 5))

Finch light blue

sleep for 5 seconds

temp2 = temperature sensor

if((temp1 – temp2) > 7)

Finch light purple

Go straight slowly

if(obstacle on right side)

Finch light red

reverse straight slowly

turn right slowly

else if(obstacle on left side)

Finch light pink

reverse straight slowly

turn left slowly

if(leftLight and rightLight < 25)

Finch light white

sleep for 5 seconds

if(leftLight and rightLight < 25)

end loop

Application Design



Relationships Between User-Developed Classes



Explanation of the Design

Software Design

In the design of the software there were some areas that expectations were met but other areas that it was not met. The robot did follow the light very well and it was able to track its brightness, but the issue is that when there was a shadow it would react adequately. The issue is that sunlight brightness is very even and so it can be hard to follow it across a surface, also there can be clouds or other things that may come across to cause shadows and this effects its reaction.

The main issue that was discovered is that the robot needed to go across a room and the sunlight is come from the side, so this causes a difference in the sensors and the robot would have reacted differently if both sensors were able to get close results. The temperature sensor on the robot worked very well and gave great readings but the difference in temperatures never varied more than a degree and so it did not help in guiding the robot. Lastly, the obstacle avoidance sensors did work well but at the end of the video when it should have work it did not work, before the recording of the video it was working well.

Remediation Plan

More testing will be needed to work with the sun and to track it in that area better instead of it going straight to the door. Understanding what the best number difference would be to set it at would be ideal. When starting out it was at 5 and then it was raised all the way to 60 but it was stopped too much and did not sense the little necessary changes. Also, a reading of what the sensors read while in the shadow will help to determine what to do when it encounters a shadow or when the sun goes beyond a certain point. Lastly, starting to test the area much earlier in the day will help to get the greatest duration of sunlight in that area for testing. Testing started about 9am but by 10:45am the sunlight had already disappeared enough to track it.

Subsumption and Simulation

The action of light sensing and tracking can be subsumed under automation because it run on its own while following the parameters set in its program. In terms of simulation it is acting like a plant as it follows the movements of the sun to reach the best sunlight for growth.

# Works Cited

(n.d.). Retrieved from iRobot: irobot.com

Matthews, K. (2019, May 16). *6 robotics applications demonstrating new tech, markets*. Retrieved from The Robot Report: https://www.therobotreport.com/6-robotics-applications-new-markets/