

CS 1010 Computer Science Orientation
Line Following Problem Solving Report

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Robot Name: Dwight

1. Problem Description:

The problem that the robot must solve is being able to ascertain the path of a black arc on a surface, and moving along that line from when it begins to when it ends. In terms of robot capabilities, it must follow a black line in the shape of an arc, on which it will be placed, and it must travel, following the line, in the direction that the masters choose, around the arc.

2. High level strategy

The robot will use a color sensor to differentiate between the black line that it is tasked to follow, and the surrounding surface that is a contrasting color. The robot will move along the line on the shape of the arc that is created by the black line, and will stop moving when the black line finishes or another button is pushed.

3. Detailed strategy

- a. Robot capabilities (describe the desired robot capabilities to solve this problem at a fine grain (e.g.: move forward, move backward, rotate, detect distance, etc.))

The robot should have the ability to move forward, sense variations in color between the black line and the surrounding surface, follow the arc by moving in a direction that is not a completely straight line, and stop once the black arc ends or another button on the robot itself is pushed.

- b. Robot components (describe the EV3 robot components that you need to use to solve this problem (e.g.: medium motor, IR sensor, etc.) and specify the ports they are connected on your robot)

The robot will need to have a color sensor in order to determine the difference between the black line it is supposed to follow and the surface surrounding the black line, as well as two large motors used for moving forward and turning around the arc created by the black line.

- c. Strategy Pseudocode (pseudocode for your strategy)

Initialize the robot components and variables for the implementation

The robot is placed on the black line, takes sample, new variable assigned to that value

The robot moves right, takes sample, new variable assigned to that value

The robot moves left

While loop: when the button is pushed, the code below begins iterating

Robot moves forward

While loop: the color sensor scans the surface it is pointed at

As the color sensor scans, it will detect a color differentiation between the surrounding surface and the black line.

If there is a shade difference detected, the robot will move along the line created by the shade differentiation until there is no longer any shade differentiation.

If there is no shade difference detected, or the shade difference is no longer detected, the robot will continue to move forward.

The robot will stop once it has been moving forward without any shade difference detected for 30 centimeters.

- d. LeJOS implementation details (for each of the actions in your pseudocode list the reference classes or functions that you think can be used to implement the strategy presented above)

Set up necessary robot components through “import” statements

This involves declaring the Color Sensor and the Large Motors and the ports that they are connected to, along with initializing the various elements, like scanners and motor ports. As well, setting up the wheels with Chassis and a differential pilot.

The robot is placed on the black line and takes a sample

The robot assigns this sample value as a new variable to represent the line color

The robot moves right 45 degrees and takes a sample of the surface (the floor) around the black line

The robot assigns this sample value as a new variable to represent the floor color

The robot moves left 45 degrees to get back to the black line

While loop: when the button is pushed, the code below begins iterating and when the button is not pushed, nothing happens with the robot.

robot.forward(); //robot moves forward

If the sample is equal to the variable representing the line color -> robot moves forward

If the sample is equal to the variable representing the line color -> robot turns (45 degrees) left and moves forward

While loop for robotIsMoving(): the color sensor scans the surface it is pointed at

Color sensor scans (using fetchSample) in order to detect a color differentiation between the surrounding surface (represented by variable) and the black line (represented another variable).

If the sample is equal to the variable representing the line color -> robot moves forward using the function "robot.forward();" and continues taking samples

If the sample is equal to the variable representing the line color - > robot turns (45 degrees) left and moves forward