CS 1010 Computer Science Orientation Line Following Problem Solving Report

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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 on 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.

3. Detailed strategy

   - 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.

   - 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 two large motors used for moving forward and turning around the arc created by the black line.

- Strategy Pseudocode (pseudocode for your strategy)

    - Initialize the robot components and variables for the implementation

    - 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.

- 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.

    - 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
  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 (as value 0) and the black line (as value 1).

        - If there is a shade difference detected (value 1) The robot will use the function “robot.forward();” to move along the line created by the shade differentiation until there is no longer any shade differentiation.

    - If there is no shade difference detected (value 0), the robot will continue to move forward with the function “robot.forward();”.

    - If the shade difference is no longer detected, the robot will use the function “robot.travel(30);” to move forward 30 centimeters after it finishes (remains at value 0) detecting a shade difference (value 1).