

CS1010

Lab2

Obstacle Avoidance Using Touch/IR
sensors

Problem Analysis

Announcements

- Ask for help!
- For each 1 hour credit you are to spend at least 3 hours outside of class to study
- Attendance is required
- Teams

Learning objectives

- Show you the process of solving a task
 - What are the steps you should go through
- Getting experience with loops
 - Why do we need loops and how to use them in the context of the class
- Getting experience with LeJOS
 - Actual LeJOS code shown and explained

Problem description

Given a wheeled robot, get the robot on the other side of an obstacle using touch/IR sensor

Expected behavior:

- On activation the robot starts moving in a straight line
- When an obstacle is encountered the robot stops
- Then robot performs an obstacle avoidance strategy
- Robot resumes going forward
- The robot stops execution when the master presses a button on the EV3 brick

High Level Strategy

In plain English what do we want the robot to do:

1. Robot move forward
2. Obstacle Detected?
 1. Robot stop
 2. Robot move backward
 3. Robot turn 90 degrees in place
 4. Robot move forward (for a small distance)
 5. Robot turn -90 degrees in place

Detailed Strategy

1. Robot Capabilities:

- Move the robot forward
- Rotate robot at an angle
- Get sensor input to detect the obstacle
- Register when a button is pressed

2. Robot Components:

- Large motors (connected to ports A & C)
- IR/Touch sensors (Connected to ports S1 & S2)

Pseudocode

```
waitForAnyPress(); //wait for the user to press a button
while ( escape button != pressed){
    robot.forward(); //start moving the robot
    collectSensorData;
    if(sensorDetectsObject){ //obstacle detected
        robot.stop();
        robot.turn(90);
        robot.travel(8);
        robot.turn(-90);
    } //end if
} //end while
```

While loop

- We need a loop to be able to do recurring actions until a specific condition is met or infinitely (not recommended)

```
while(boolean_condition
){
    /*statements in here execute
    only if the boolean_condition
    is evaluated to true */
}
```

```
do{
    /*statements in here execute
    at least once */
}while(boolean_condition);
```

More on loops can be found on: https://gwu-cs1010-f17.github.io/java_notes.html

LeJOS – Differential pilot

- To perform movements with the robot I would use a differential pilot.
- A differential
 - drive consist of two motors whose rotary axes lie along the same line and which can be rotated independently.
 - Provides unpatrolled control over the direction and speed of the robot, and allows the robot to turn in place

We need:

- 2 EV3LargeRegulatedMotor

```
EV3LargeRegulatedMotor LEFT = new EV3LargeRegulatedMotor(MotorPort.A);
```

```
EV3LargeRegulatedMotor RIGHT = new EV3LargeRegulatedMotor(MotorPort.C);
```

- 2 Wheel

```
Wheel wheel1 = WheeledChassis.modelWheel(LEFT, 3.0).offset(-7.5);
```

```
Wheel wheel2 = WheeledChassis.modelWheel(RIGHT, 3.0).offset(7.5);
```

```
//the offset number is the distance between the center of wheel to the center of robot (to calculate it measure the distance wheel to wheel, divide it by 2 and subtract half of the with of the wheel
```