CSCI 458: Autonomous Mobile Robotics

Assignment Name: Line Follower

Assignment Number: 6

Group Members: Nisha Patel & Ricky Hempel

Project Description:

In this assignment, we used the light sensor to track a line for our line follower robot. For testing purposes. We were provided a map with a black line on a white background, and the robot should follow the path in a quick, accurate, and smooth manner. Our demonstrations will be judged based on the following dimensions, the accuracy of line tracking, speed of line tracking, and smoothness of the ride.

What Worked (Source and/or Build):

The hardware that worked is when we put the light sensor in front of the robot's body which is pointing directly to the ground. It is placed very close to the ground to track a line. The light sensor is touching the ground so it can detect and track a line to fulfill the line follower functionality.

With the software, we used a threshold for the black line that was found by taking a reading on both a dark surface (the line) and a light surface (the background), adding them together, then dividing by 2. After we calculated the threshold, we then used getColorReflected() on it. Our robot is capable of following the line as long as it satisfies the following condition: we have condition statement which compares the light sensor value to the threshold value of 15. When the light sensor value is less than 15, the robot is detecting the black line. On the other hand, the robot does not recognize the line when the amount of light sensor is greater than or equal to 15.

What Didn't Work (Source and/or Build):

With the hardware, we many challenges with the light sensor. First, was getting it in the right position. The first try it was too close to the ground it would get a value from the black line that would make the threshold an odd number. Then we would get it too high so that would not read the black line.

With the software, was the most challenging part of the assignment. We first tried setting the motor power to turn when it is getting too far in the black and white region by getting the color reflected value in the white and black area. Then subtract it from the different values that the sensor receives on its journey and multiplying it by one to get the value that sets the motor's speed. We also tried setting the speed of the motors to different values like 10, 15, and 39 before deciding that 15 would be the right value to get the smoothness that we were looking for in this assignment. We also had a bug in our program where it would work for a long, but it would eventually turn too far and get off the line.

What I feel that I learned from this assignment:

We learned how to track a line using a threshold and conditional statement to detect a black and white region. Also, we learned how positioning works concerning the sensor and the ground.

Build Details

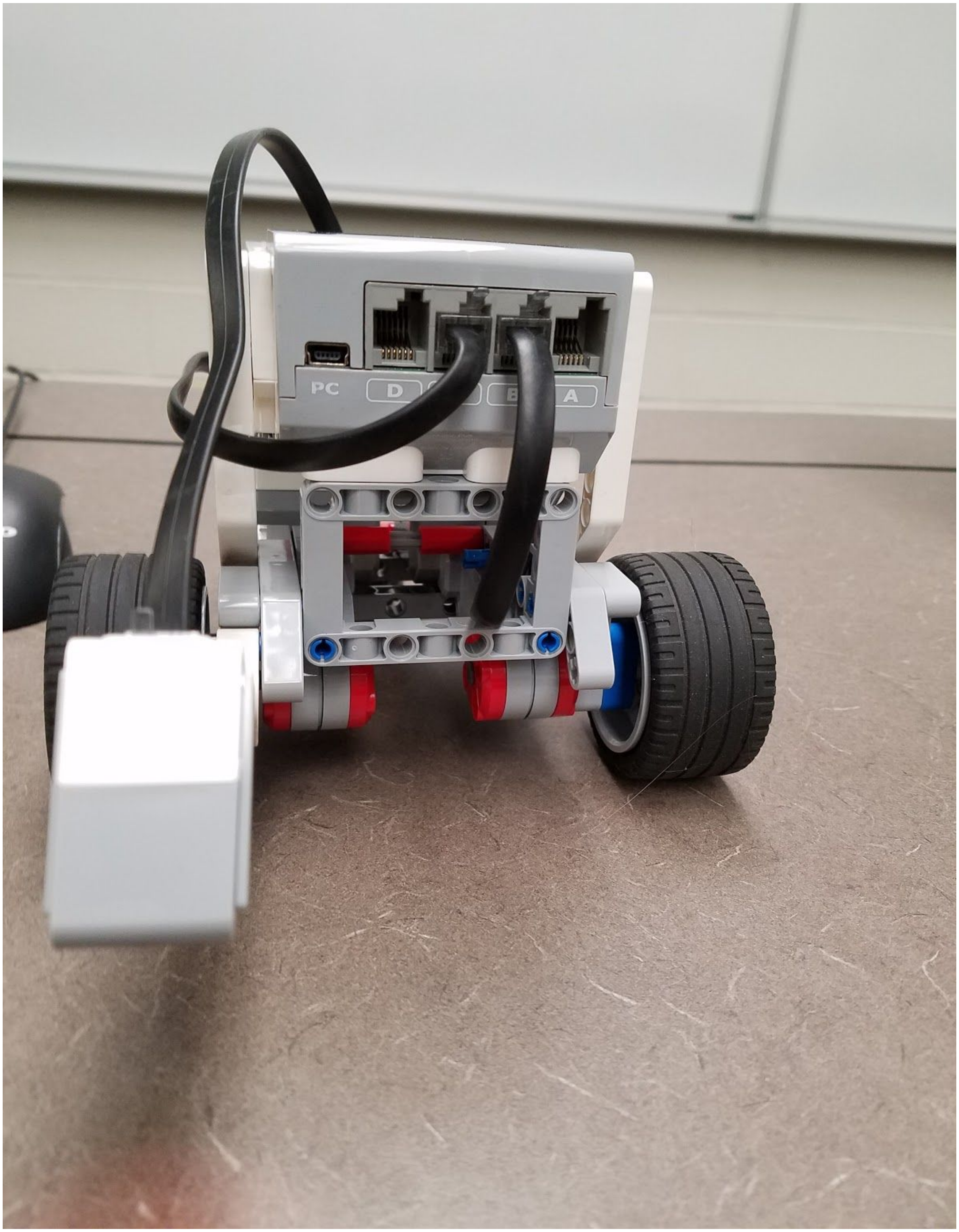

Figure 1: First attempt at a line following robot.

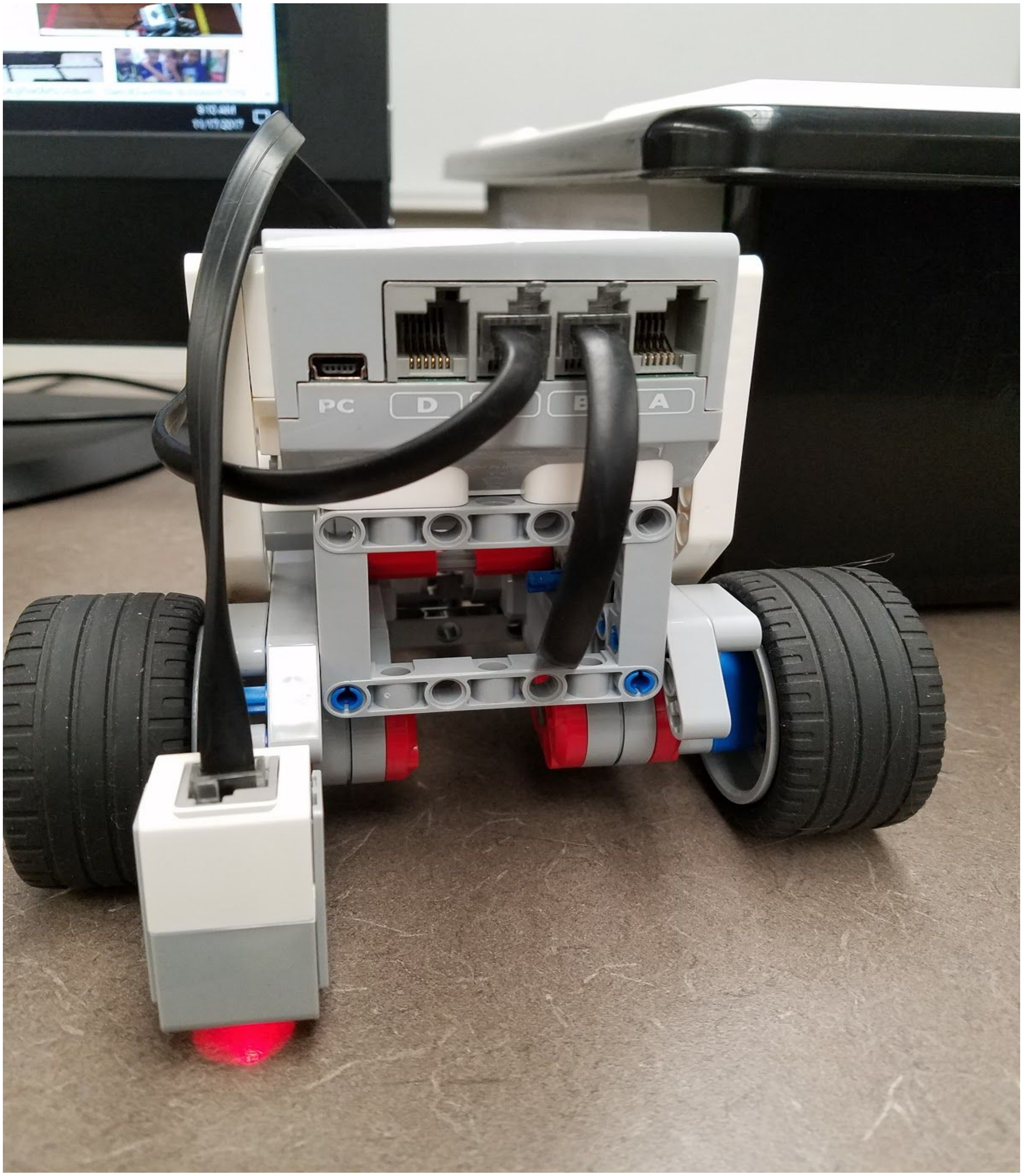

Figure 2: Final build.

Source:

```
/****************
Name Ricky Hempel & Nisha Patel
Purpose source code for linefollower.c
Date   11/20/17
**************/
#pragma config(StandardModel, "EV3_REMBOT")
#pragma config(Sensor, S3, sonar3, sensorEV3_Color)
tMotor Left_Motor=motorB;
tMotor Right_Motor=motorC;
task main(){
    int threshold = 15; // Light sensor threshold
    //to detect a white line or region
    while(getColorReflected(S3) > threshold){
        setMotorSpeed(Left_Motor, 25);
        setMotorSpeed(Right_Motor, 25);
     }
    setMotorSpeed(motorB, 0);
    setMotorSpeed(motorC, 0);
    wait1Msec(500);
    // to detect a black line
    while(getColorReflected(S3) <  threshold){
          setMotorSpeed(Left_Motor, 25);
          setMotorSpeed(Right_Motor, -25);
      }
     setMotorSpeed(Left_Motor, 0);
     setMotorSpeed(Right_Motor, 0);
     while(true){
//If the Light Sensor reads a value less than 30, then the robot is seeing the
//black line
      if(getColorReflected(S3) < threshold){
            setMotorSpeed(Left_Motor, 25);
            setMotorSpeed(Right_Motor, 0);
        }
// If the Light Sensor reads a value greater than or equal to 30, then the robot
//is not seeing  a black line
        else{
           setMotorSpeed(Left_Motor, 0);
           setMotorSpeed(Right_Motor, 25);
        }
      }
}
```