



Educational Robots for Absolute Beginners

Robot Project 5

Information for the Workshop Participant:

Directions:

Complete the assignment below and then ask your reviewer to use the attached instructions to check your work. You may attempt the project as many times as you would like; remember the purpose is to expand on what you have learned.

Additional Notes:

Before attempting this project assignment, we recommend that you

1. Try out the programs shown in the videos for yourself. Make sure that you understand how to write them yourself, and that when you download them to your NXT, it behaves as expected.
2. Try writing the programs shown in the videos again, from scratch, again and again, until you get to the point where you can do so without peeking at the video or at your previous program.
3. Complete Robot Projects 1-4. That said, you may find that this project is somewhat easier than project 4. In future versions of this class, we are contemplating swapping projects 4 and 5. We'd be interested in your opinion on this.
4. Complete the following optional *troubleshooting tasks* to help you prepare:
 - a. Attach the light, sound, and ultrasonic sensors to your robot. The sound sensor can be placed anywhere. The light sensor should be placed so it's looking outwards and not towards the ground.
 - b. Experiment with using the light sensor in the room where you will demonstrate your project:
 - Write a program that waits for a bright light and then says "good morning."
 - Ideally, turn the lights out, start your program, and then turn on the lights.
 - If you can't control the lights in your classroom, then you can experiment with shining a flashlight at the light sensor or covering the sensor with your hand to simulate darkness.
 - Remember, once you've downloaded this program to the NXT for the first time you can look at the light values the sensor is seeing. You will need to do so to determine the difference between "dark" and "bright."
 - c. Experiment with using the sound sensor:
 - Write a program that makes the robot wait until it hears a loud sound and then says "good morning."
 - Download the program, click on the block that is waiting for the loud sound and experiment with making noises to see what values the sensor gives you – How loud is a clap? How loudly can you say "Stop?"

While we strongly recommend that you complete the above tasks, they are all optional and do not need to be reviewed.

Many thanks to Nick Handley (one of the teachers you met in week 1) for some of the ideas in this assignment.



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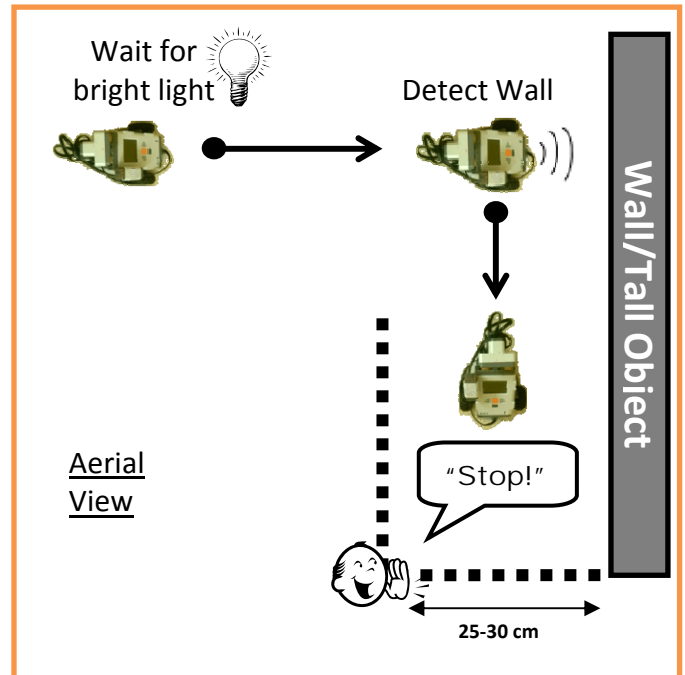
Assignment:

Create a new program called **Project5**.

In this program you are going to pretend that your robot is returning to its parking space. As shown on the right, the robot will:

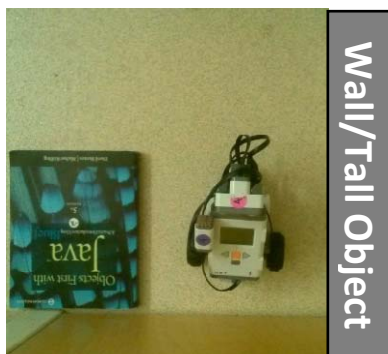
- Wait until it sees a bright light
- Start moving, and drive until it is “near” a wall
- Make a 90 degree turn to the right, and drive until the robot hears a loud noise (we suggest you yell “Stop!”)
- Stop moving

If you don’t have an available wall for this project, you can simply use a big box or another object to represent the wall.



You have a few options for the bright light. If you are able to turn off the lights in the room you are working in, then you can start with the lights off and have the robot detect the lights turning on. If you cannot control the lights, then you can shine a flashlight directly at the light sensor to start it moving. If the lights in your room are so bright that you can’t detect a flashlight, then you may start running the program with your hand covering the light sensor, and remove your hand to make the light “bright.”

To make this project a little more interesting, we are asking you to define a “parking space” that is approximately 25-30 cm wide that the robot will drive into. The parking space is defined by the wall on one side, and two other objects, indicated by the dotted lines in the graphic above. Here are two examples of “parking spaces” that we designed: the first uses a book and a bookcase and the second uses a pair of rulers. These objects make the project a bit more visually appealing and also make it easier for you and your evaluator to confirm that your robot is driving “into” the parking space:





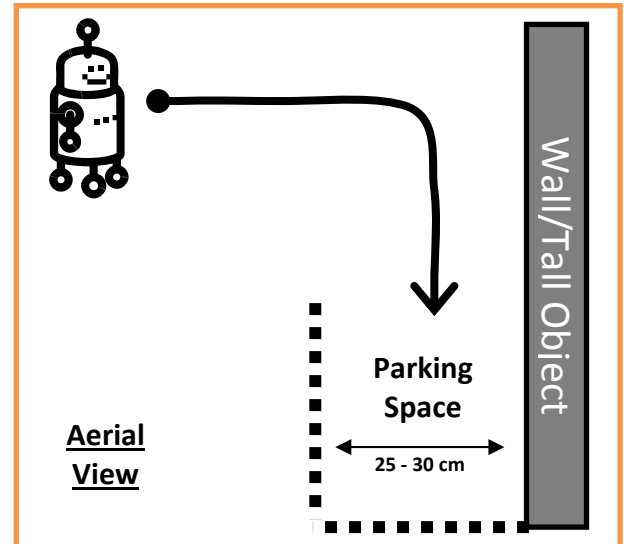
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Information for the Project Reviewer

In this project, the robot will drive into a parking space that is defined by one wall and two objects (if no wall is available, it can be simulated by using a large box or other tall object).

The parking space is 25-30 cm wide. The participant has been instructed to come up with a way to indicate the location of the other two sides of the space (shown as dotted lines in the picture on the right). They are free to use anything: a book, a ruler, some pencils, pieces of tape, etc. The important thing is that the location of the space is clearly indicated to you and the participant.



Light



Ultrasonic

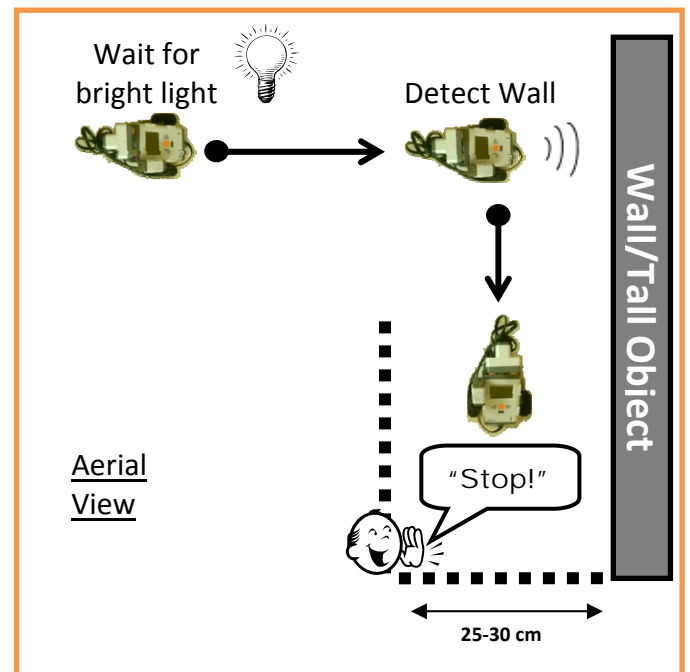


Sound

This project is not simply a driving project; rather, it requires the robot to make use of three different sensors: the light sensor, the ultrasonic distance sensor, and the sound sensor.

To begin, the robot should be placed facing the wall. Once the program is started, the robot should remain stationary until it detects a bright light. Then it should drive forward until it detects that it is near the wall. At that point it should turn 90 degrees to the right, and proceed forward into the parking space until it hears a loud noise, and then the robot should stop moving.

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Information for the Project Reviewer (Continued)

You should test this program two or three times, modifying the robot's initial position relative to the wall and the parking space each time to ensure that the robot is using the ultrasonic distance sensor to detect when to turn. The test needs to take place in the same room that the participant practices in to ensure that the light levels are correctly recognized.

Summary of each test:

1. Begin with the robot facing the wall. If it is possible to turn out the lights in the room, do so. If not, the participant may cover the light sensor with his or her hand.
2. The robot should not begin to move until it detects the light around it getting brighter
 - If you started with the lights out in the room, turn on the lights and the robot should start moving.
 - If you started with the participant covering the light sensor, he or she should remove his or her hand and the robot should start moving.
 - Alternatively, the participant may point a flashlight at the robot's light sensor, at which point the robot should start moving.
3. The robot should approach the wall and make a 90 degree turn to the right when it detects that the wall is sufficiently close:
 - This turn may be in place or a gradual curve
 - The point at which the robot begins to execute the turn is up to the participant. Any distance from the wall is fine as long as the robot then heads into the parking space.
4. The robot should move forward into the parking space. Once the robot has entered the space, the participant should make a loud noise, at which point the robot should stop moving.
5. When the robot stops, it should be positioned inside of the "parking space."