Lesson Plan for Intro to Robots

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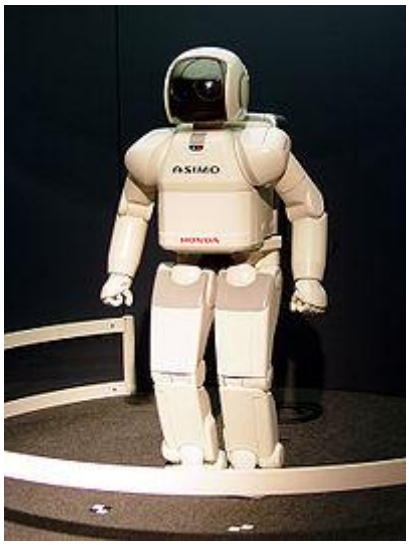
Introduction/Background Info

Robots are everywhere. Most of us do not really think about it but robots are shaping how we live each and every day. Many of the manufacturing processes that were performed by huge assembly lines of people are now replaced by hordes of robots. One of the best examples of this is car assembly lines which are mostly automated. Although robots have an obvious manufacturing utilization, they are having a much larger presence in our daily lives as well. If anyone hates vacuuming, then they have probably heard of the vacuuming robot, Roomba. Of course, as engineers, we do not just use robots for vacuuming. Many engineers in college actually have a hand in building their own robot. Each of these robots is designed with a specific purpose in mind and it is this kind of problem solving that all robots are designed for. In other words, robots are always designed to solve a certain problem. These problems could range from a simple academic problem like designing a robot to climb up a slope or to a much more practical application like designing a robot to do your dirty dishes.

Vacuuming Robot, Roomba



Walking Robot from Honda

The future of robot innovation is heading in the direction of making humanoid robots, that is making robots that are humanlike. The above picture shows ASIMO, a robot created by Honda that mimics human walking. Although these robots are still relatively "dumb", the field of robot research is progressing rapidly. However, if a robot is designed with artificial intelligence and glowing red eyes then this engineer votes that we should demolish it right away.

Student Objectives

- To introduce students to the wide world of robotics
- To familiarize students with basic programming
- Playing with robots!

Topic(s)

- Robotics
- Sensors
- Programming

Overview of Lesson Process

We have a troublesome robot that wants to wander away all of the time. Since we don't want our robot to get far away from home and get lost, we will "draw" a "box" on the ground with electrical tape to keep the robot inside. We need to write a "box" program for the robot that will "teach" it to stay inside the box instead of wandering away all of the time.

- Survey students' prior knowledge about programming, sensors, and robotics. Explain that programs are like a set of instructions given to a robot to accomplish a specific task. Sensors help the robot become aware of its surroundings so it can carry out these instructions, based on its environment (5-10 min).
- Fill out worksheets to write the "box" program (10 min).
- Enter the "box" program from the worksheet into the robot. Test if the program works (20 min).
- Wrap-up, concluding remarks, quasi post-test, what is being done in research? (5-10 min).

Materials

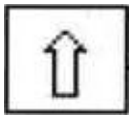
- LEGO Mindstorm Robot (~$250), three (or more) per site
- Electrical Tape (one roll, ~$1.00), one (or more) roll(s) per site

Procedures

1. Introduce students to the different sensors on the robot with the pre-loaded "Try Me" programs.
    a. Push the orange ("OK") button to turn the robot on.
    b. Push the left arrow to scroll over to "Try Me" and push the orange button to select it.
    c. Try running each of the Try-programs one at a time, so the students get a feel for how each of the sensors work. Use the orange ("OK") button to execute programs, and use the grey ("BACK") button to return to previous menus.

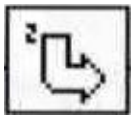
2. Ask the students to plan out their “box” programs on their worksheets.
3. “Draw” a “box” on the ground with the electrical tape. The dimensions of the box should be at least 2 feet on each side.
4. Enter the “box” program into the robot.
    a. Push the grey (“BACK”) button several times to return to the home screen.
    b. Push the right arrow to scroll over to “NXT Program” and push the orange button to select it.

    c. Push the orange button again to confirm the port settings.
    d. Enter the students’ “box” program from their worksheet. Select each command block one at a time with the arrows, and push the orange (“OK”) button to enter each block into the program. The correct order for the “box” program is listed below:
        i. Forward (move forward until the next condition is satisfied)



        ii. Dark (when the light sensor sees a dark color, move on to the next command)

        iii. Back right 2 (backup and turn right for 2 seconds)



        iv. Empty (do nothing, move on to the next command)

        v. Loop (go back to step 1)

    e. Select “Run” to execute the “box” program.

Resources

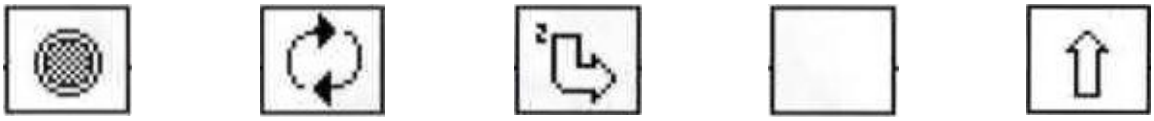
1. http://mindstorms.lego.com/en-us/default.aspx

Intro to Robots Worksheet

We have a troublesome robot that wants to wander away all of the time. We don't want our robot to get far away from home and get lost, so we will "draw" a box on the ground with black tape to keep the robot inside. We need to write a "box program" for the robot that will "teach" it to stay inside the box instead of wandering away all of the time.

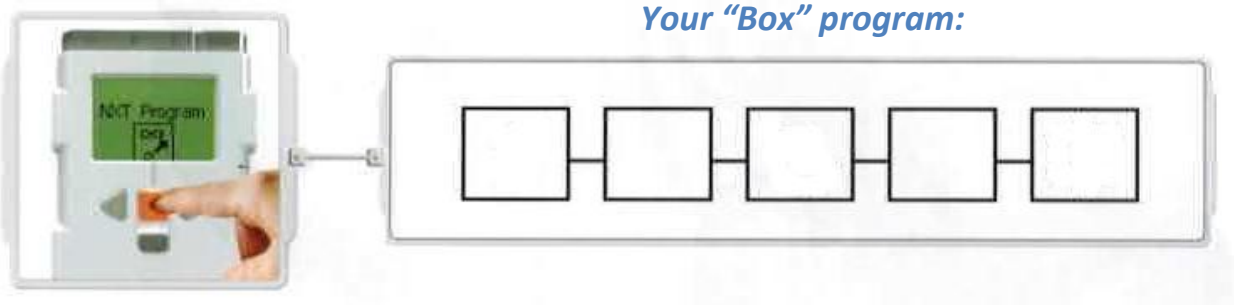
Here are 5 commands that we can give the robot, in any order we like.

Dark *Loop* *Back right 2* *Empty* *Forward*



Can you put the five commands above in the correct order to keep the robot inside a "box" made from black tape? Draw the commands in order, using the five empty boxes provided below.

Your "Box" program:



If you have time, design a new program on your own. Trying using other sensors!

Your new program: