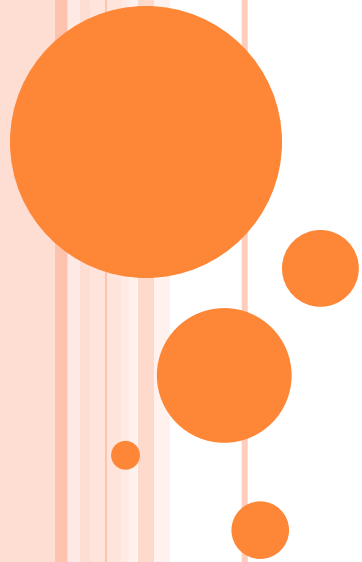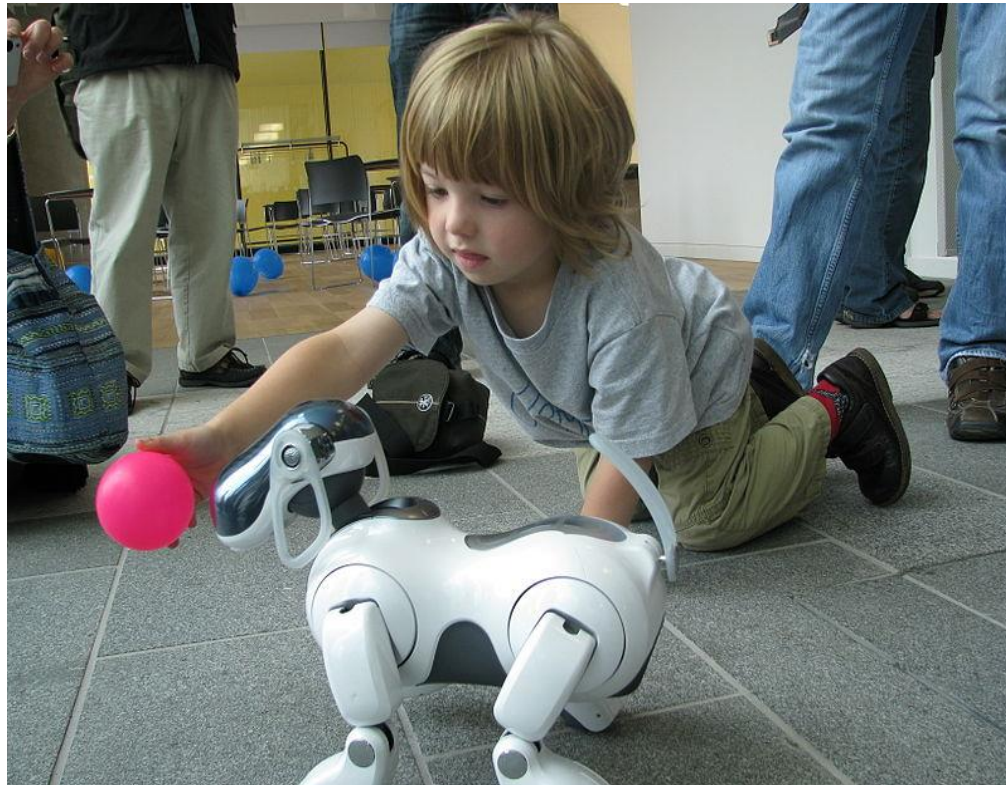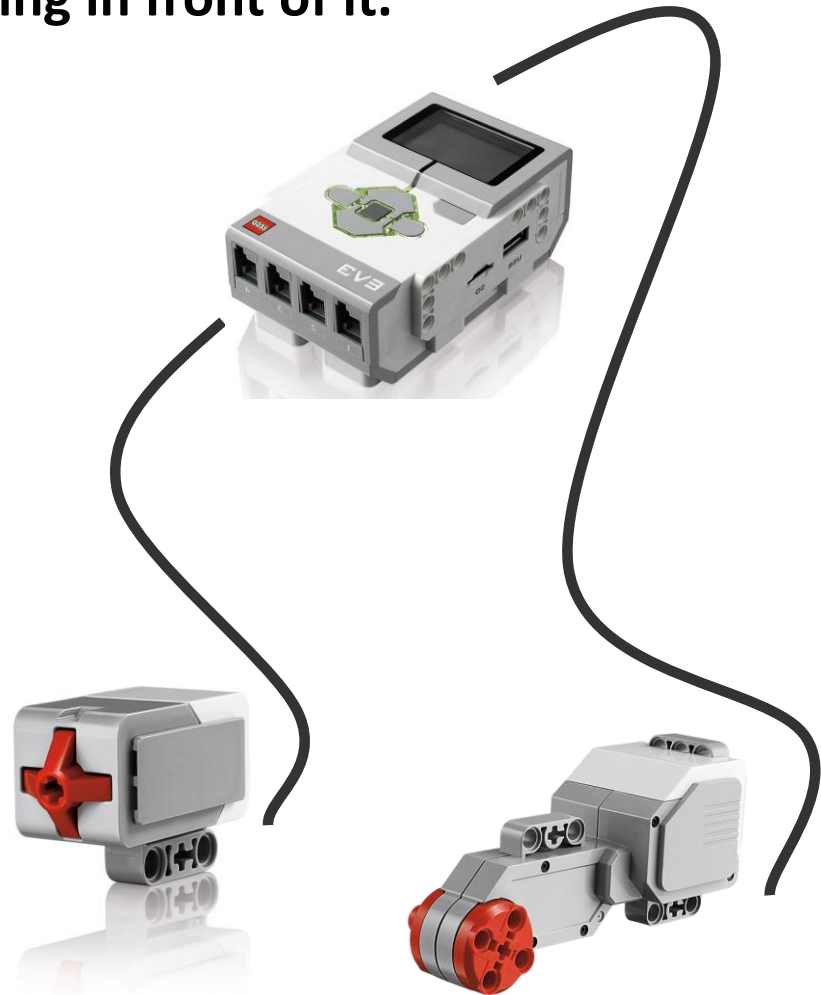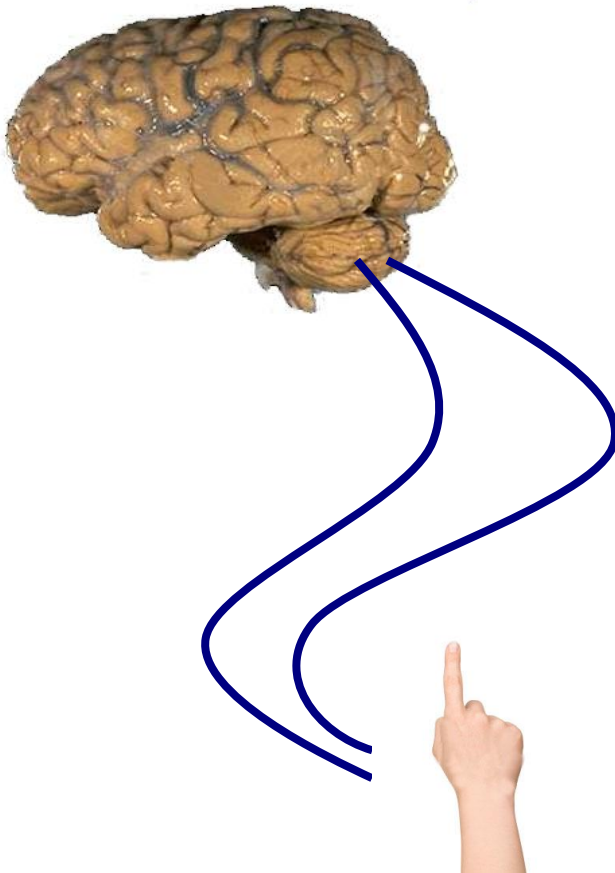# That's Hot!
Robot Brain Programming

Engineering Challenge

Program your TaskBot with a touch sensor to mimic a person's reaction when touching a hot object. Program it so that it withdraws quickly when the sensor touches something in front of it.

Stimulus-to-Response Framework

stimulus → **sensor** → **coordinator** → **effector** → **response**

touch → **pain receptor** → **nervous system** → **muscle** → **movement**

Looking at the sequence of steps above, this is what happens when you touch something hot: The **stimulus** is touch, the **sensor** is the temperature/pain receptor on your finger that senses it and relays it to the nervous system (spinal cord and brain), which is the **coordinator**. The coordinator makes the decision of how to react, and then commands the hand muscles (acting as the **effector**) to jerk back quickly.

The framework takes us from stimulus (touch) to response (hand movement)

Sketch out how the stimulus-to-response sequence might be implemented in a robot. Identify all the components as in the example listed above.

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Activity Assessment

[maximum 40 points]

1. **The touch sensor was correctly assembled on the robot (using instructions) [max 5 points]**

2. **The computer program makes the robot move forward [max 15 points]**

3. **The touch sensor worked as planned, that is, it made the robot move back quickly upon being activated by an obstacle (for example, wall in front) [max 20 points]**

Solution

## Using LEGO EV3 robot to mimic a reflex

Go straight, slowly. If the touch sensor is activated, move back and "run"!

Description: This program is for an EV3 robot with an attached touch sensor. The program causes the robot to move forward until the touch sensor is activated. Once this occurs, the robot runs backwards towards the right, immediately, to simulate a reflex-type reaction. In this solution, it is set to continuously do this until the program is stopped.
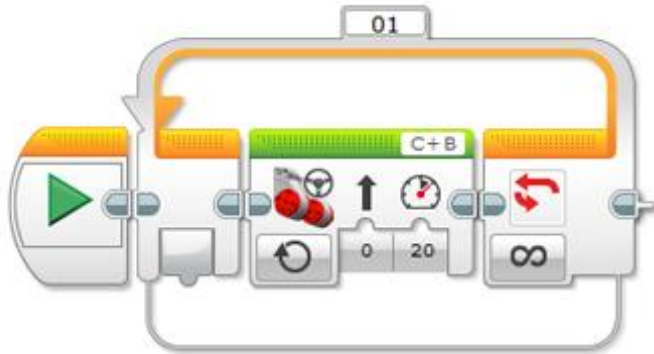

Programming:

1) Click the "Loop" icon and drag and drop the loop command onto the sequence beam.
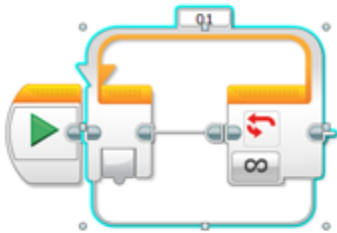
With the loop command highlighted, verify the loop control is set to forever in the control panel.

Solution (continued)

2) Click the "move" icon and drag and drop the move command inside of the loop command.

With the move command highlighted, verify the following settings in the control panel.

    a.   Port: B and C selected
    b.   Direction set to forward
    c.   Steering slider set to forward [in the middle]
    d.   Power set to 20
    e.   Duration drop down menu set to "Unlimited"

Solution (continued)

3) Mouse over the "wait for" icon and click on the touch icon then drag and drop the touch wait for command to the right of the move command. and inside the loop.
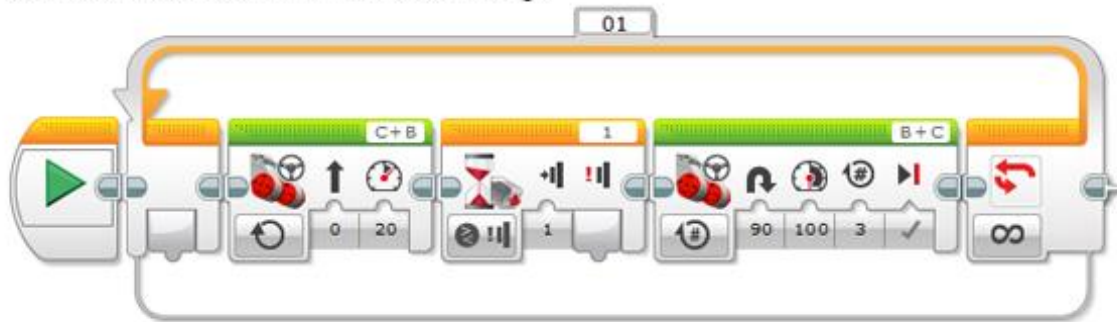

With the touch wait for command highlighted, verify the following settings in the control panel.
   a.   Control: Sensor
   b.   Sensor: Touch Sensor
   c.   Port: 1 (or whatever port the touch sensor is connected to)

Solution (continued)

4) Click the "move" icon and drag and drop the move command to the right of the sound wait for command, and inside of the loop

With the move command highlighted, verify the following settings in the control panel.
- a. Port: B and C selected
- b. Direction set to backwards
- c. Steering slider to right (as shown below)
- d. Power set to 100
- e. Duration set to 3"Rotations"

Image Sources

Image 1a: child and robot dog; source: 2008 Stuart Caie, Wikimedia Commons
http://commons.wikimedia.org/wiki/File:AIBO_ERS-7_following_pink_ball_held_by_child.jpg