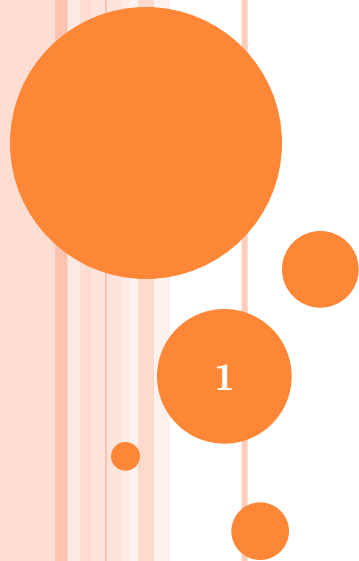# ACTIVITY

MOVEMENT TASK USING SENSORS - HUMANS AND ROBOTS (75 MINUTES)

1

SENSORS REVIEW
(10 MINUTES)

- Measure quantity, send information
  - Two types
    - Some detect presence of a stimulus (Type I)
    - Some detect quantity/value of a stimulus (Type II)
- Can you give an example of a type I and type II touch sensor?
  - Answer: Type I tells you if it got pressed or not, type II tells you how hard it got pressed.

2

HUMAN SENSORS

- What are the sensors in the human body?
  - Five Senses
  - Other Senses that we don't directly notice
    - Can you name any that we discussed in the lesson?
    - Answer:
      - Sensors in inner ear give brain information about balance
      - Sensors in muscles give information about body position
      - There are even sensors in the blood vessels which tell the brain how much acid is in the blood.

- How do they send signals to the brain?
  - Nervous System
  - What are the two parts of the nervous system?
  - Answer:
    - Peripheral Nervous System
      - Nerves that connect to sensors send information through a series of nerves to your central nervous system
    - Central Nervous System
      - Made up of Spinal Cord and Brain
        - Signal travels up Spinal Cord to the brain

3

ROBOT SENSORS

- What do they do?
  - Gather information from the surroundings and send it to the Computer brick.
  - Robot Sensors can only be used if the Robot's program asks for information from them!
  - Similarly, the Robot can only act on information from the sensors if its program tells it to!
- How do sensors send signals to the Computer brick?
  - The sensors send information through the wires that connect them to the Computer brick, which uses the information if its program requires it.

4

ACTIVITY PART I (TIME:10 MINUTES) – FOR TEACHER

- Split the students into groups of two
- Mark four points on the ground – say on the corners of a 5 foot square. Space the points farther apart to increase degree of difficulty.
- Have one person in each group close their eyes and have the other member direct the first around the room with verbal commands.
- The goal is to become the first group to have the member with his/her eyes closed touch all four points, following the RULES on the next slide.

5

ACTIVITY PART I – STUDENT RULES

- **Rules: Understanding human sensors and human movement**
  - **The command giving partner can *only give commands that follow a specific format*: The command must tell the partner to walk a certain number of steps in *one* direction.**
    - **Example: Move three steps to your right.**
    - **Example of incorrect command: Move a little to your right then turn slightly left and walk forward.**
      - **Why above command is incorrect: First, it specifies movement in multiple directions, instead of only one direction. Also, command doesn't specify an exact number of steps to walk.**
  - ***NO COMMAND CAN BE GIVEN WHILE THE PARTNER IS IN MOTION!!* Commands can only be given after previous commands have been executed.**

6

Activity Part I – Discussion Questions

- How difficult is it to command someone that is unable to sense anything for him/herself?

- How would senses have made this activity easier?

- What's the most important sense in your daily life?

Part II: Understanding robot sensors and robot movement (Time:35 minutes)

- Engineering Design Challenge A - Using the LEGO NXT software, ask students to create programs to get their taskbots through the maze (Students may use solutions from Activity I, Understanding Communication with a Robot)

- **Engineering Design Challenge B – Now, use a sensor to improve your robot's ability to navigate the maze.**

8

ACTIVITY PART II - SENSORS AND THE MAZE – DISCUSSION QUESTIONS

- Explain why your team chose that specific sensor and how did you use it?
- What do you think are the pros and cons of your sensor?
- How would you improve your robot's design?
- How would you compare the robot traversing the Lego maze to the human maze activity from earlier?

ACTIVITY II: GROUP LEARNING AND POST- ASSESSMENT USING JEOPARDY (10 MINUTES)

10

DESCRIPTION OF JEOPARDY

Jeopardy rules

• Team 1 will get the opportunity to choose and answer the first question
• If they are unable to answer the question, then Team 2 gets to choose
• The question keeps cycling through all of the teams (repeating if necessary) until either one team gets it right, or the teacher determines that the question will likely not be answered and just gives the answer to the class.
• The team that correctly answers the question is given the points for that question.
• Once the answer of the question is known, Team 1's turn is over. The next question is chosen by Team 2, which then gets to answer the question. This process then continues until all questions are completed.

11

Final Jeopardy Rules

• Each team is given a writing utensil and a piece of paper

• Each team will be given a period of time to write down their answer to the final Jeopardy question

• Along with their answers, the teams should also write down the number of points they are willing to 'wager' on their answer. The maximum number of points that a team can wager is the number of points that they currently have. If their answer is correct, they gain the number of points that they wagered. If their answer is incorrect, they lose the number of points that they wagered.

• The teams then submit their answers for grading by the teacher.

Conducting the Jeopardy session

• Simply open the 'Post activity assessment-Jeopardy' powerpoint and choose the slide show view

• Click on the particular point value in the particular column chosen by the students and read off the "answer" (in jeopardy, teams are given the 'answer' to a question and must come up with the 'question').

• To view the 'question', click on the 'question' button.

• To go back to the main screen, simply click on the icon in the bottom right corner of the screen.

DO NOT SAVE A JEOPARDY FILE AFTER PLAYING A GAME! ALWAYS KEEP A COPY OF THE ORIGINAL FILE!