

## The Journey Inside<sup>SM</sup>: Microprocessors Student Handout: Taking Command

### Taking Command

A computer follows the instructions it is given. To make a computer function correctly, the instructions must be specific and must be in exactly the right order. Computer programmers must learn to communicate with a computer using a language that the computer understands. A computer language is made up of a small number of very specific instructions.

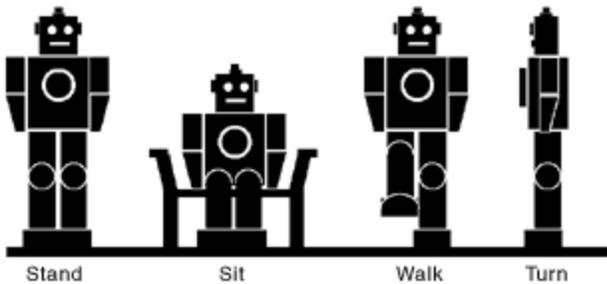
To practice the ideas necessary to make a computer follow instructions without learning a special computer language, you can make up your own language. Suppose that you have a robot that understands just four words: stand, sit, walk, and turn. These words are defined to mean:

**Stand:** Stand up

**Sit:** Sit down

**Walk:** Take one step forward

**Turn:** Turn 90 degrees to the right



These words can be used to provide instructions for your robot so the robot can do a variety of tasks. For example, if you need your robot to turn left 90 degrees, there is no specific word to use. However, the action can be accomplished if you give the robot the directions: turn, turn, turn.

### Activities

1. Place a chair several feet from the wall of your classroom. Imagine your robot is sitting on the chair. Use the four words the robot knows to write instructions to move your robot from the chair to the wall, turn it around, return the robot to the chair, and sit it down.

When you are working with your robot, use the fetch, decode, and execute cycle. Each instruction will take quite a bit of time to fetch and decode. So, write your program with as few instructions as possible.

In carrying out the set of instructions, four students will be needed. One person will play each of the following roles:

**Memory:** Holds the list of instructions. Passes an instruction to Fetch.

**Fetch:** Gets an instruction from Memory and carries it to Decode.

**Decode:** Reads an instruction out loud so that Execute can hear it.

**Execute** (the robot): Carries out the instruction.

When each person in your group has completed the list of instructions, test some of the lists. When you find a list that works correctly, make sure each person in your group understands the list of instructions.

2. Using the list of instructions that works correctly, have the shortest person in your group play the part of the robot. Then have the tallest person in your group be the robot. What happens?
3. Again use the same list of instructions, but this time move the chair two or three feet closer to or farther away from the wall. Try your set of instructions again. What happens?