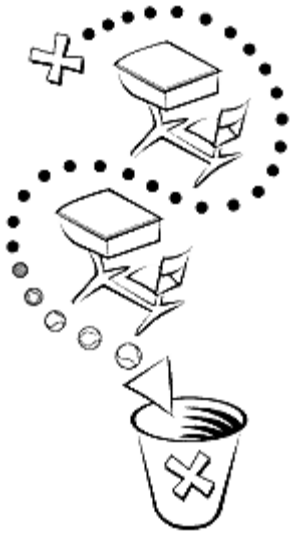

Thinking Machines

Until robots become true "thinking" machines, able to understand their environment and make decisions about what to do to accomplish their mission, they will depend on computers to guide them. The computer is called the “controller”

In this activity you will work with a partner to find out how hard it is to accurately guide a robot through even simple tasks.

Materials

- Blindfold
- Notebook
- Shoe box (or some other container that size)
- Object (tennis ball)

1. Working with a partner, one of you will take on the role of a robot, the other the controller. The person playing the robot should be securely blindfolded and given the ball.

2. The robot, following verbal instructions from the controller, must move along a prescribed course (down an aisle and around a desk, for example) and then deposit the ball in the container. The robot can't talk during the first attempt and must follow the directions given to it exactly ("turn right" doesn't necessarily mean all parts of the body or 90° right). After the robot has successfully put the ball in the container, the robot and controller should switch roles and try it again.

3. When you have both completed the task, figure out what the most difficult part in communicating instructions was, then develop a written glossary of commands to make maneuvering easier. Define a specific length for a step (the length of a piece of notebook paper, for example) and instead of saying "turn right" or "turn left," work out specific angles for the size of turns ("turn 20 degrees to the right," for example).

4. Repeat the mission again using a different route, taking a turn in each role. Did the glossary make things easier for both the robot and the controller? Was there less misunderstanding?

5. Try it again, but this time draw a map of the route the robot is supposed to take. The controller must sit facing away from the course the robot must follow, but this time the controller will use the robot's eyes (which in a real robot would be a camera). The controller must use the map to keep track of the robot's location and is allowed to ask "yes" and "no" questions so the robot can give feedback about its surroundings. The robot must still await the controller's instructions before moving.

Questions

1. What problems might you face if the robot wasn't as smart as you or your partner?

2. The minimum round-time for a signal between Earth and Mars is 8.8 minutes; the maximum time is 41.9 minutes. How would you change your commands if they took 20 or 30 minutes to reach your robot? What dangers would that delay cause?

3. What sensory devices could you add to the robot to make controlling it more precise?