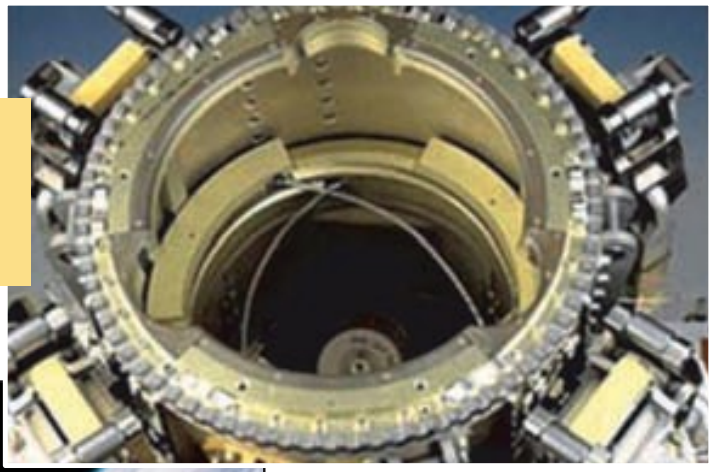
activity ten

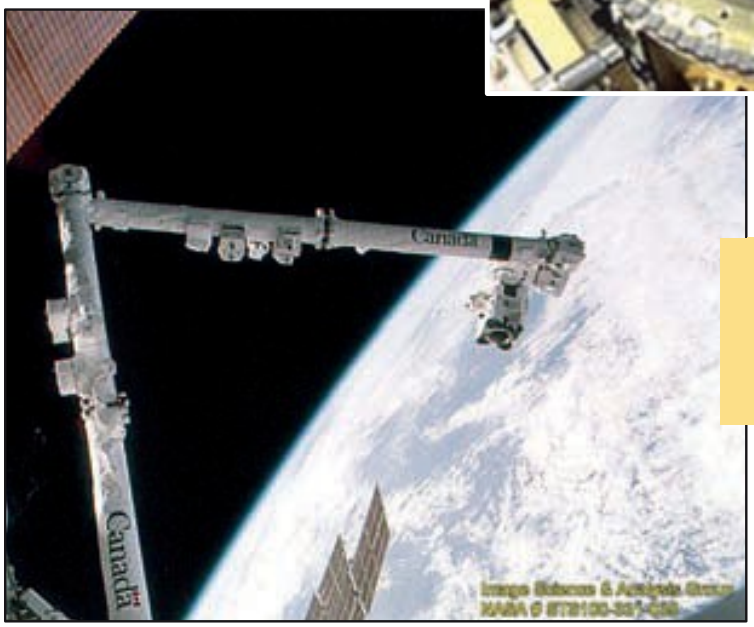
An Introduction to Robotics

OBJECTIVE

Students will learn how a device, called the "Effector" can be used to pick up and move items much like the Space Shuttle's Robotic Arm. Students will also learn about how to work as a team to create and use a robotic hand.



The Latching End-Effector



Shuttle With Canadian Robotic Arm

Robotics Activity One
End Effector

NATIONAL SCIENCE STANDARDS

Content Standard E: Science and Technology
- Abilities of technological design

Unifying Concepts and Processes
- Evidence, models, and explanation

BACKGROUND

The word robot comes from the Czech word robota that means forced or repetitive labor. Czech playwright Karel Capek coined the term for his 1920 play R.U.R. (Rossum's Universal Robots). In the play, the human-like robots take over the world.

Today's robots usually look very different from humans. They are found in manufacturing, research, medical treatment, entertainment, and space. NASA uses robots to explore Earth and the other planets and to manipulate payloads on the Space Shuttle and the International Space Station.

The definition of what a robot is varies with the source referenced. Generally, robots are machines that operate by computer controls. On Earth, robots are often used for dangerous, dirty, or dull jobs. Examples include painting and welding robots in automotive assembly lines and robots used to dismantle old nuclear power plants. In NASA-sponsored experiments, walking robots were used to explore active volcanoes in Alaska and the Antarctic.

One of the most important objectives in the development of robots is to enable robots to interact with their environment. Interaction is often accomplished with some sort of arm and gripping device or end effectors. This type of robotic activity was used aboard the Mars Rovers, Spirit and Opportunity.

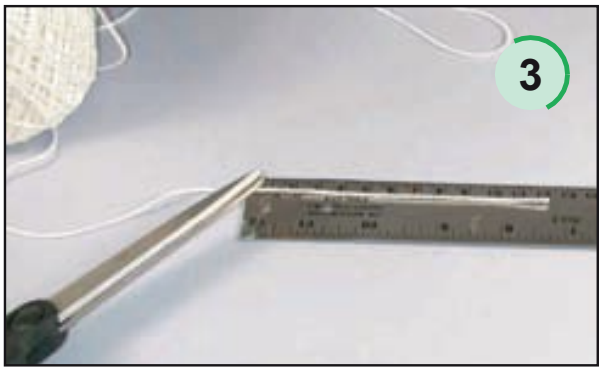
MATERIALS

1. Two Styrofoam® coffee cups
2. Three pieces of string
3. Scotch or similar household tape
4. One serrated plastic picnic knife

These are the only materials you need to make an end effector.

PROCEDURE:

Two coffee cups are held together and a plastic knife is used to cut both in a line as shown in this photo.



Next, three pieces of string are cut to a length of 12 cm.

The string pieces are taped first on the inside just below the cut edge. The other end of the string is positioned outside but the tape is not pressed down.

While holding the rim of the inner cup, rotate the outer cup until the three strings cross each other. The strings will have some slack. Pull the end of the strings on the outside until they are straight and intersect in the middle. Now press the tape on the outside to hold the strings.

You have now created an "Effector" and it will pick up a small object like a pencil. Have someone hold the pencil upright. Open the end effector so that the strings are not crossing each other. Slip the end effector over the pencil so that it extends down the center and not through any of the loops. Rotate the outer cup until the strings grasp the pencil. You should now be able to pick up the pencil.