Environmental Science Institute
THE UNIVERSITY OF TEXAS AT AUSTIN

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I Want To Hold Your Hand

Revised by Duc Tran, Environmental Science Institute: 10/19/2010
From "I Want to Hold Your Hand" by the National Aeronautics and Space Administration (NASA); 2004 – 2005 NASA SCI Files Series http://www.nasa.gov/pdf/172353main_Hold_Your_Hand.pdf

GRADE LEVEL: 6 - 8

TEKS: Grade 6: 3B, 3C; Grade 7: 2A, 2B, 3A, 3B, 3C; Grade 8: 2A, 2B, 3A, 3B, 3C

PURPOSE

Students will construct a robotic-like hand and demonstrate the differences and similarities between a robotic hand and a real human hand.

BACKGROUND

Robots are machines that collect information from their environment and utilize that information to follow instructions and complete tasks. Today's robots encompass multiple sensors, enabling them to make their own decisions based on the acquired information. Robots come in all shapes and sizes. The jobs they do are also varied. Some robots are used in factories. Others are experimental robots that use artificial intelligence. Artificial intelligence allows robots to behave and act independently in a changing environment. Today, robots are used in hospitals, space, ocean exploration, and other dangerous areas.

MATERIALS PER GROUP

- Narrow rubber bands
- Drinking straws
- Cardboard
- Tape
- Scissors
- Nylon cord
- Centimeter ruler
- Pen

PROCEDURE

1. To make the palm of the robotic hand, cut a piece of cardboard 10 cm x 10 cm.
2. To make the fingers, cut three pieces of cardboard 2 cm x 9 cm.
3. To make one of the fingers jointed, cut one of the cardboard pieces into three equal pieces. See diagram 1.

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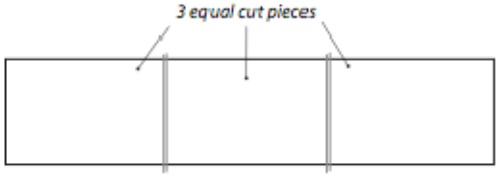

Diagram 1

4. Place the three equal finger pieces back together by using tape to reconnect them. Label one side of the taped finger "inside." See diagram 2.

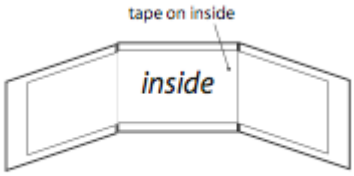

Diagram 2

5. Cut a rubber band 5 cm long.
6. Turn the segmented finger over so the "inside" is face down.
7. Put the rubber band across the middle of the first joint. See diagram 3.

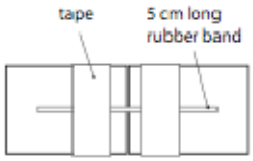

Diagram 3

8. Tape the rubber band on both sides of the joint, making sure to leave the ends of the rubber band untaped.
9. Fold the ends of the rubber band so that they rest on top of the tape and tape them firmly in place. See diagram 4. Taping prevents the rubber bands from slipping.

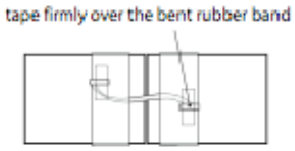

Diagram 4

10. Repeat steps 5 through 9 for the second joint.
11. Tape the finger onto the palm with "inside" facing up.
12. Turn the hand over.
13. Cut a rubber band 5 cm long.
14. Put the rubber band across the last joint (touching the palm).
15. Repeat steps 8–9 for the last joint, connecting the finger to the palm. See diagram 5.

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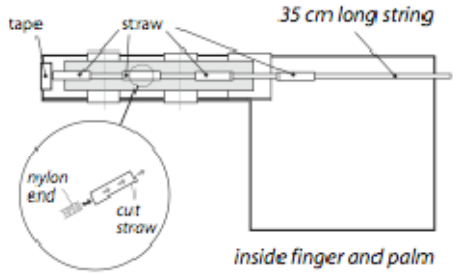
connecting fingers to palm

Diagram 5

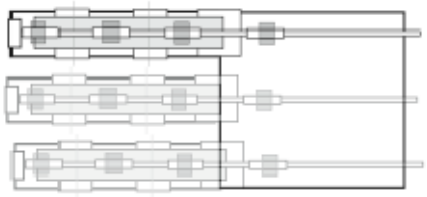
16. Cut a piece of nylon cord 35 cm long.
17. Tape one end of the nylon cord over the end of the finger. See diagram 6.



inside finger and palm

Diagram 6

18. Cut four pieces of straw 2 cm each.
19. Thread the pieces of straw onto the nylon cord.
20. Tape a piece of straw in the middle of each finger section.
21. Tape the last straw to the palm. See diagram 7.



inside finger and palm finished

Diagram 7

22. Repeat steps 3–21 for the last two fingers.
23. Operate the hand by pulling the nylon cord.
24. You should be able to pick up an empty soda can or other lightweight objects.

SAMPLE DISCUSSION QUESTIONS

1. What items can you pick up with your robotic hand?
2. What would happen if you added a thumb?
3. Why is it difficult to pick up certain items with your robotic hand?
4. What could a real robotic hand be used for? Write or draw your ideas in your science journal.
5. What are some merits and limitations of a robotic arm?
6. What are some similarities and differences between a robotic hand and a human hand? Make a Venn diagram.

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7. What is an opposable thumb? What are some of its functions?
8. Fold your thumb in toward the palm of your hand and wrap a piece of masking tape around your hand to immobilize your thumb. Now try to do various daily tasks without the use of your thumb. Were you able to tie your shoes, put a button through a buttonhole, or fasten a snap? Try holding a fork or a spoon, peeling a banana, or catch a ball.