

National Aeronautics and Space Administration



I Want To Hold Your Hand

Purpose

To construct a robotic-like hand and to demonstrate how data are collected when using robotic technology.

Background

A robot is a machine that collects information from its surroundings. It uses that information to follow instructions and to complete a task. Today's Robots have multiple sensors and are able to make their own decisions based on given 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 more like human beings and to act independently in a changing environment. Today, robots are used in hospitals, space and ocean exploration, and other dangerous areas.

Materials Per Group	
<ul style="list-style-type: none">• Narrow rubber bands• Drinking straws• Cardboard• Tape	<ul style="list-style-type: none">• 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.

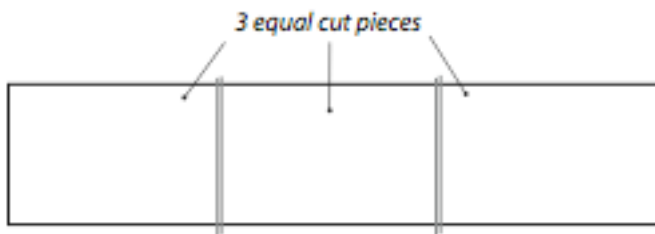


Diagram 1

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

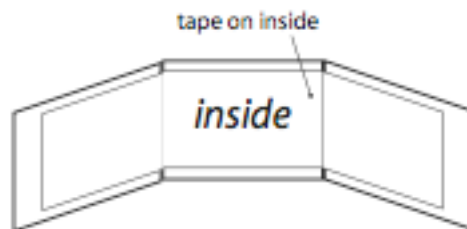


Diagram 2

5. Cut a rubber band 5 cm long.
6. Turn the segmented finger over so the "inside" is face down.

- Put the rubber band across the middle of the first joint. See diagram 3.

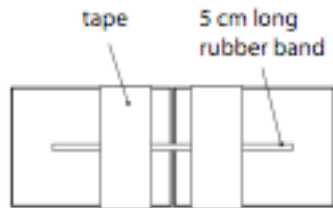


Diagram 3

- Tape the rubber band on both sides of the joint, making sure to leave the ends of the rubber band untaped.
- 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.

tape firmly over the bent rubber band



Diagram 4

- Repeat steps 5 through 9 for the second joint.
- Tape the finger onto the palm with “inside” facing up.
- Turn the hand over.
- Cut a rubber band 5 cm long.
- 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.

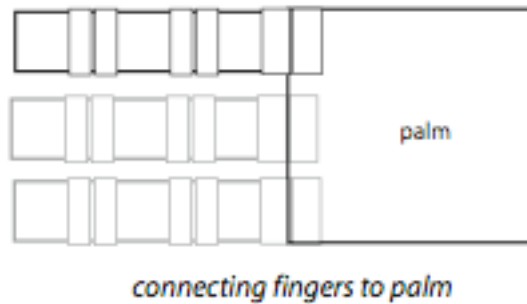


Diagram 5

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.

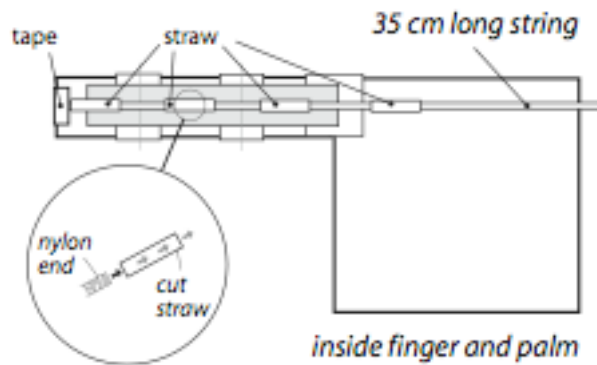
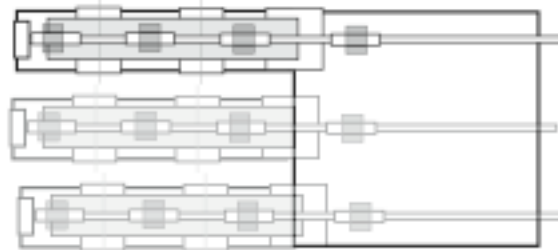


Diagram 6

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.

Tips:

- May need to cut the tape pieces to make them thinner.
- Make sure the rubber bands are taped firmly. If there is any loose area, the hand will not work properly.

Conclusion

1. What items can you pick up with your robotic hand?
2. What would happen if you added more fingers?
3. What would happen if you added a thumb?
4. Why is it difficult to pick up certain items with your robotic hand?
5. What could a real robotic hand be used for? Write or draw your ideas in your science journal.

Extension

1. Fold your thumb in toward the palm of your hand. 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 spoon or peeling a banana. Can you catch a ball?
2. Make a Venn diagram to compare your hand to the robotic hand you made.
3. Add more fingers or a thumb to your robotic hand. Does it make a difference?
4. In your science journal, draw or write about some of the things you can and cannot pick up. Write why you think some things cannot be picked up with your robotic hand.

Answer Key

1. Answers will vary.
2. The hand should be able to pick up more items because more fingers will add strength.
3. Having an opposable, or moving thumb, allows us greater dexterity. Adding a thumb to the hand should allow you to pick up smaller items and complete tasks that require some skill.
4. Answers will vary.
5. Answers will vary