

Name: _____ Pd: _____ Sci#: _____

NASA: National Aeronautics and Space Administration

I Want To Hold Your Hand

(complete these questions AFTER you have built your hand)

Extension

1. 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. _____

2. 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?

3. Design and add a thumb to your robotic hand. Does it make a difference?

4. Next add more fingers to your robotic hand. Does it make a difference?

Include a small photo of you & your robotic hand

Conclusion :

1. What items could you pick up with your 1st robotic hand?

Once you added a “thumb”, what items could you pick up?

2. What happened with your first hand, and only 3 fingers?

What happened when you added more fingers?

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. For next year’s students:

a) What was the greatest challenge you had in designing & building your robotic arm?

b) What suggestions do you have in designing & building the robotic arm?

c) What was the best part about this design-engineering project?

d) What would you change, in this engineering project?

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 :

- ___Narrow rubber bands
- ___Cardboard
- ___Scissors
- ___Centimeter ruler
- ___Drinking straws
- ___Tape
- ___Nylon cord
- ___Pencil

Procedure

1. To make the palm of the robotic hand, cut a piece of cardboard 10 cm x 10 cm. Set aside.
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.**

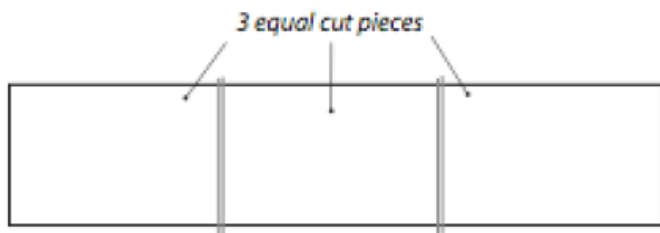


Diagram 1

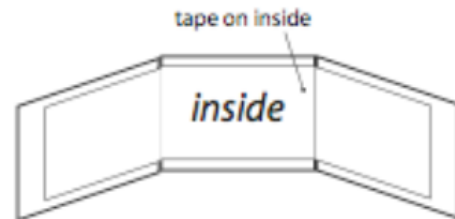


Diagram 2

4. Place the 3 equal finger pieces together and use tape to reconnect them. Label one side of the taped finger "inside". **See 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**

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

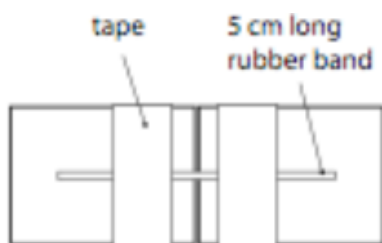


Diagram 3

tape firmly over the bent rubber band



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 as shown in **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**.

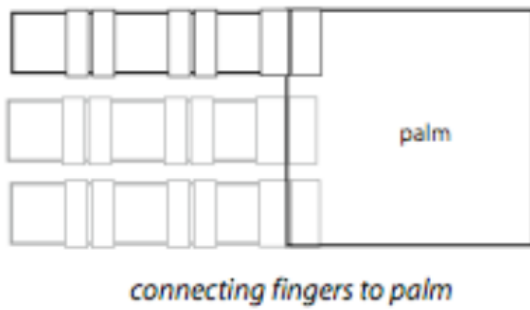


Diagram 5

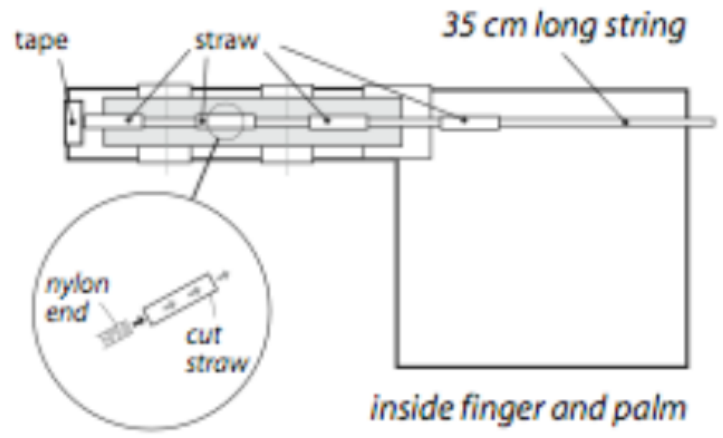


Diagram 6

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.

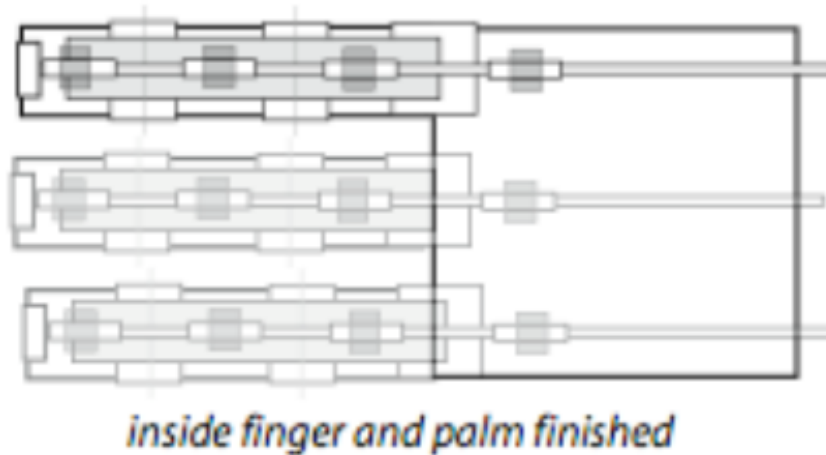


Diagram 7

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.