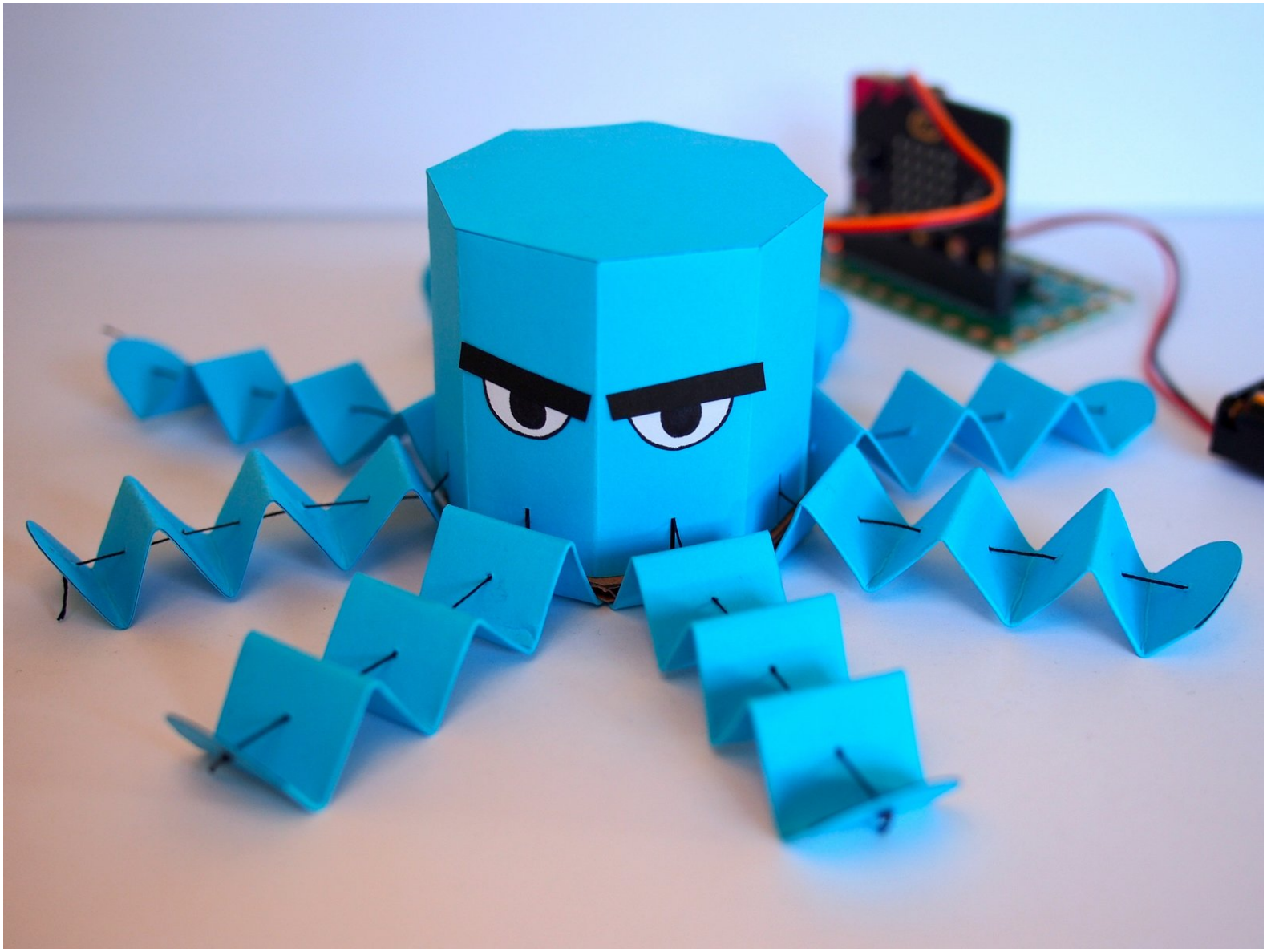
Octobot

Written By: Jasmine Florentine



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INTRODUCTION

Make a paper octopus that retracts its tentacles.

TOOLS:

- Glue (1)
- Sewing Needle (1)
- Scissors (1)

PARTS:

- Cardstock (3)
- Crazy Circuits Bit Board (1)
- micro:bit (1)

  v2
- Brick Compatible 360 Degree Servo (1)
- 2 AAA Battery Holder (1)
- Sewing Thread (1)

  A relatively thick thread is best for durability
- Cardboard (1)

  Small piece (5" x 5" is plenty)

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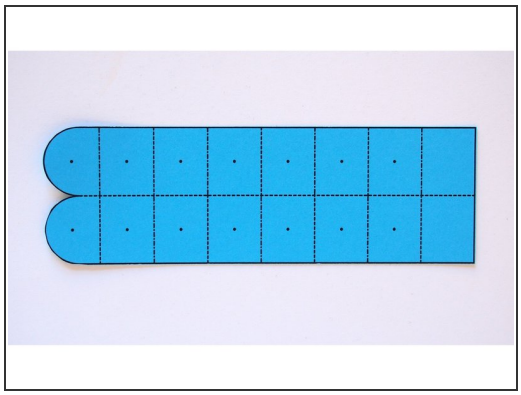
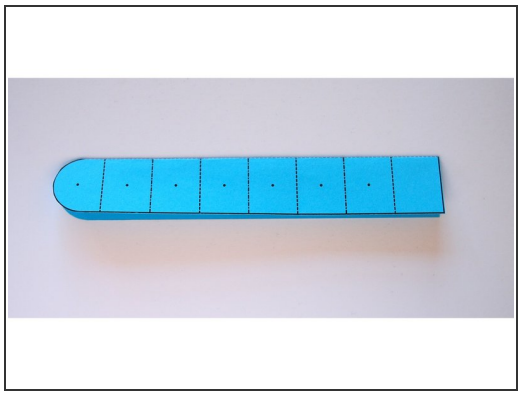
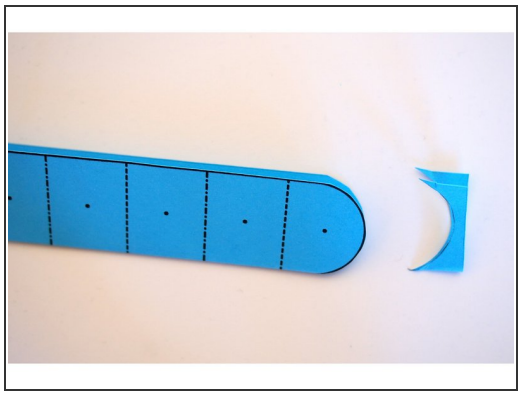
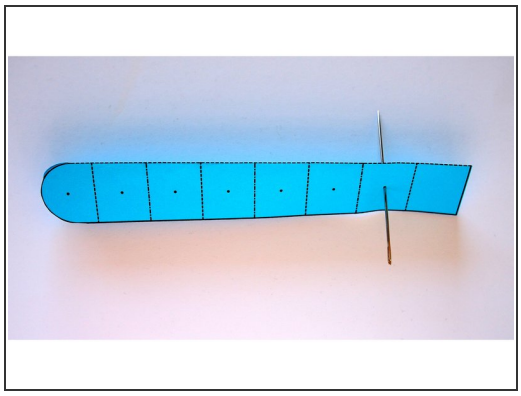
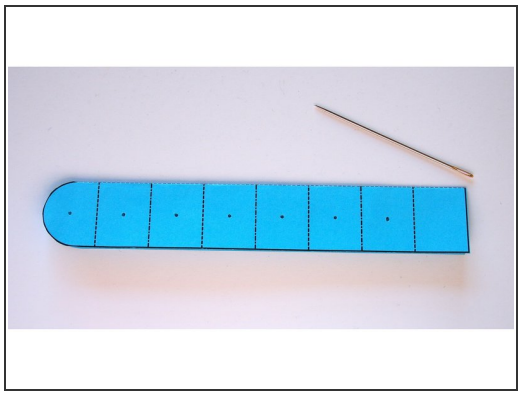
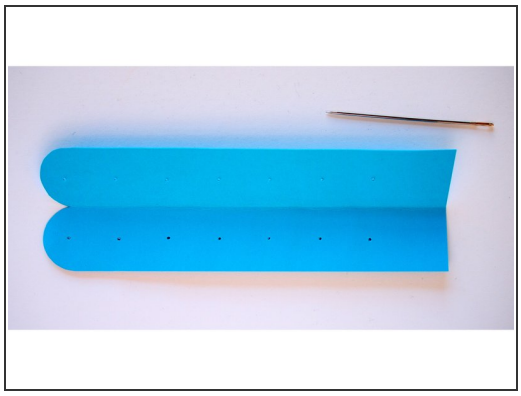
Step 1 — Making the Tentacles

- Cut out a tentacle
- Fold it in half with the template markings on the outside

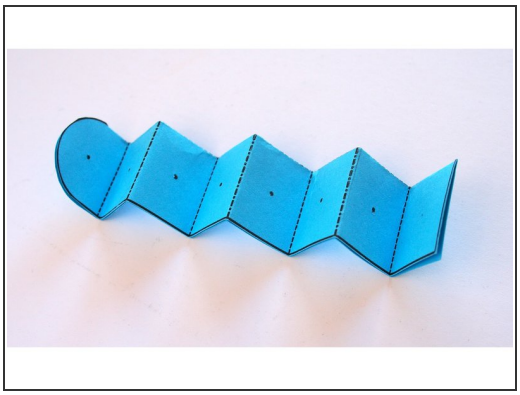
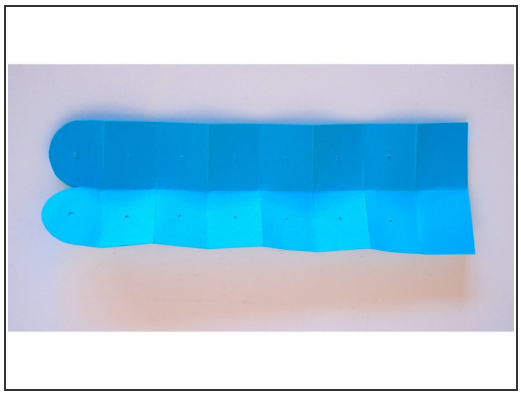
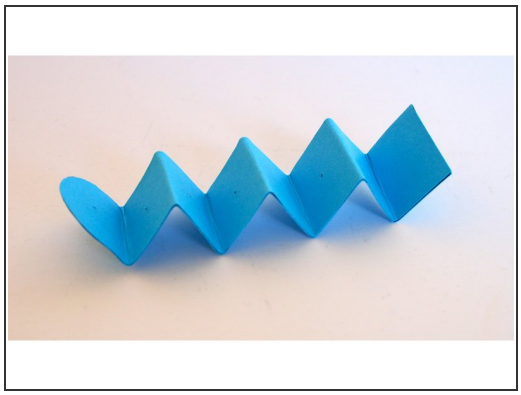
ⓘ Tip: You can save some time by folding the tentacle in half, then cutting the rounded top part

Step 2 — Poke the Holes

- Use a sewing needle to make the holes in the marked locations
- Make sure to go through both layers of paper

Step 3 — Invert the Tentacle

- Fold the tentacle in a zig-zag
- Unfold the tentacle, then refold it inside out so the template markings are on the inside
  - You can also leave the template markings on the outside if that's your style!
- Optional: add glue when you fold it in half to hold the two layers together (it's not necessary since it holds its shape pretty well without glue)

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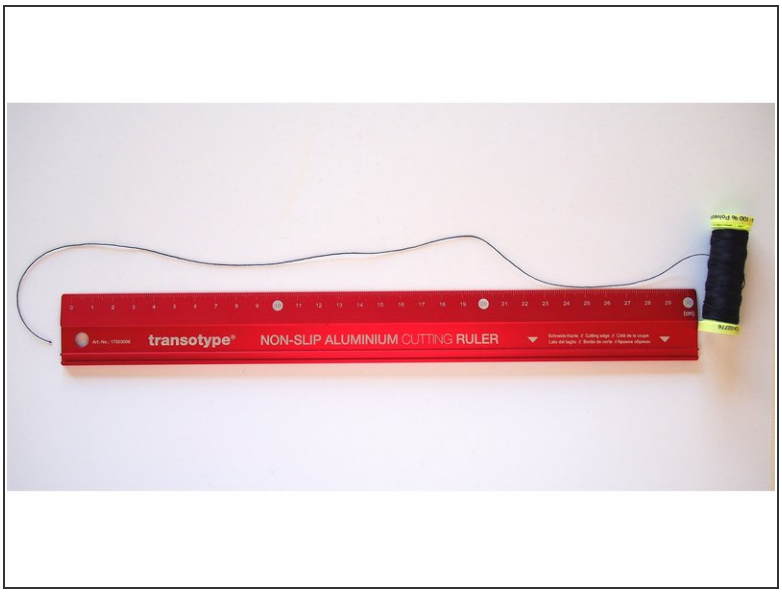
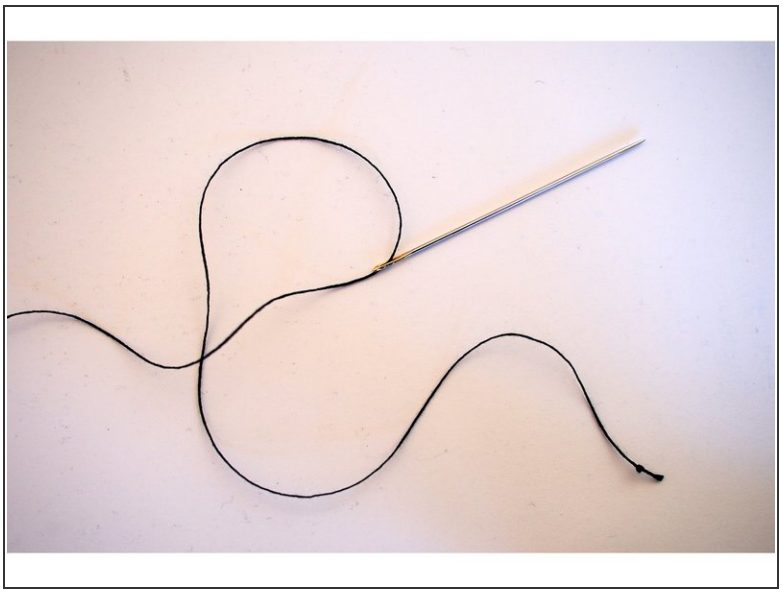
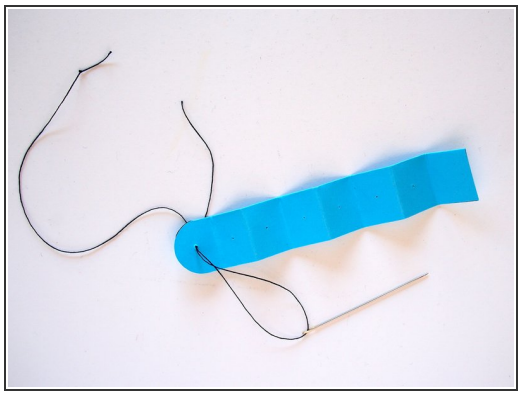
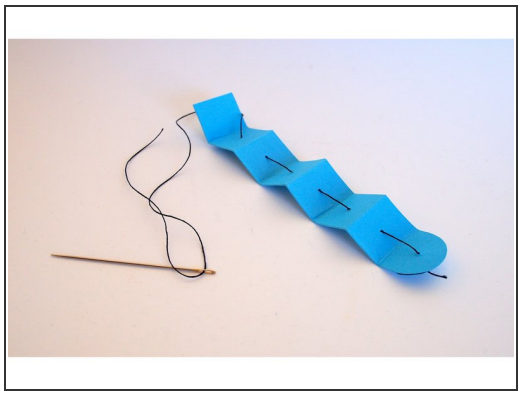
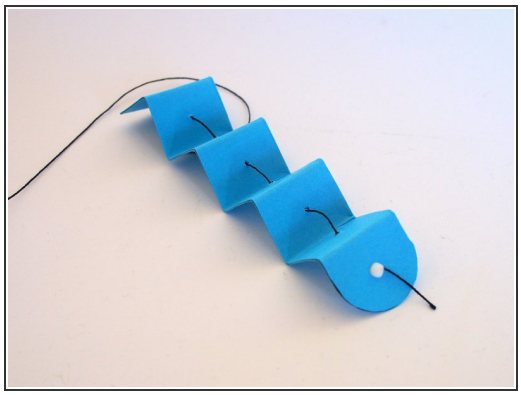
Step 4 — Cut and Knot the Thread





- Cut a piece of thread around 12" long
- Double or triple knot the end of the thread
- Thread the needle

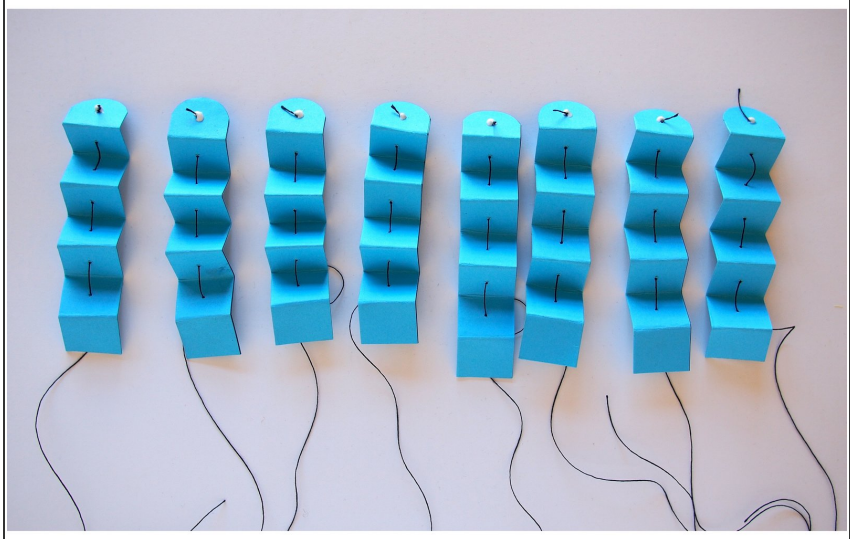
Step 5 — Sew the Tentacle

- Use the holes you made in step 2 to sew the thread through the tentacle
- Make sure to start from the rounded end of the tentacle, and on the outside of the zig-zag fold
- Add a drop of glue (or tape) on the knot to make sure it doesn't pull through the paper

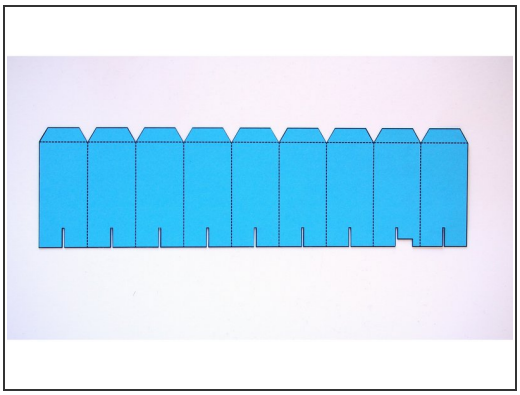
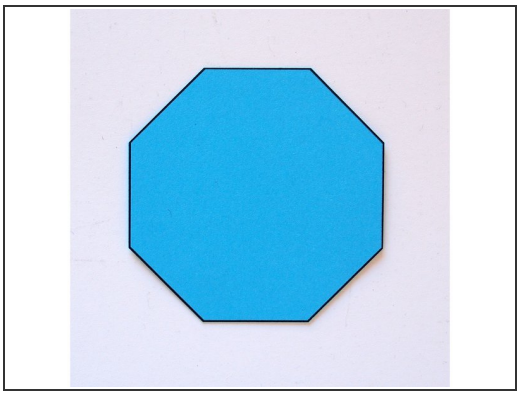
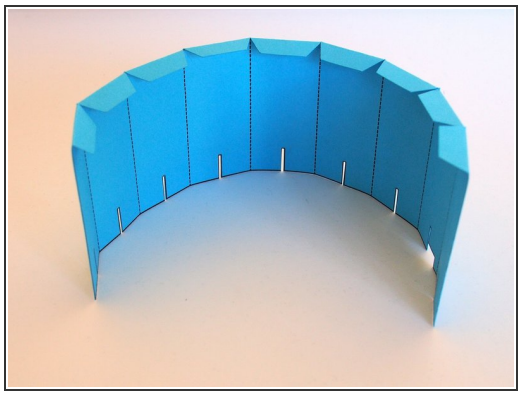
ⓘ Double check that the knotted end is on the rounded side of the tentacle, and the extra thread is on the opposite side

Step 6 — Make More Tentacles!



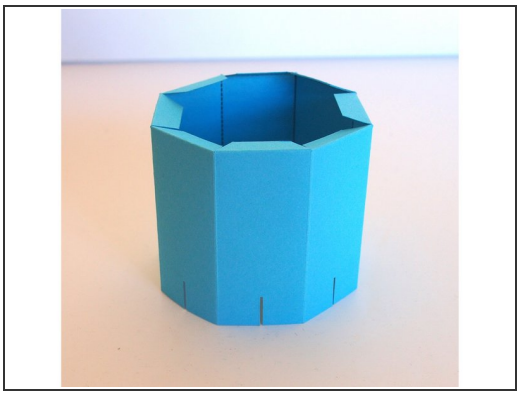
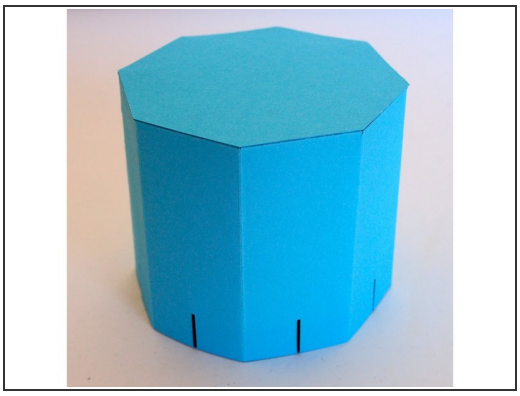
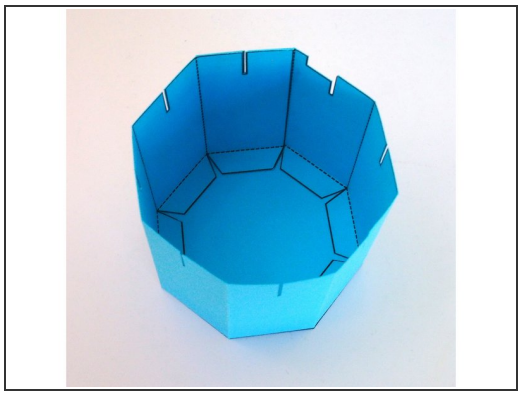
- Repeat 7 more times until all 8 tentacles are finished
- Set the legs aside for now to let the glue dry
- Are you regretting making a robot with 8 legs? Just be glad it's not a centipede!

Step 7 — Making the Body

- Cut out the template for the body and top
- Fold the body following the markings on the template

Step 8 — Assemble the Top and Body

- Glue the body into an octagon shape (the two sections on either end should overlap on top of each other to form 8 sides)
- Glue the top on to the tabs

ⓘ Tip: I found it easiest to flip the body upside down while I was gluing the tabs in place

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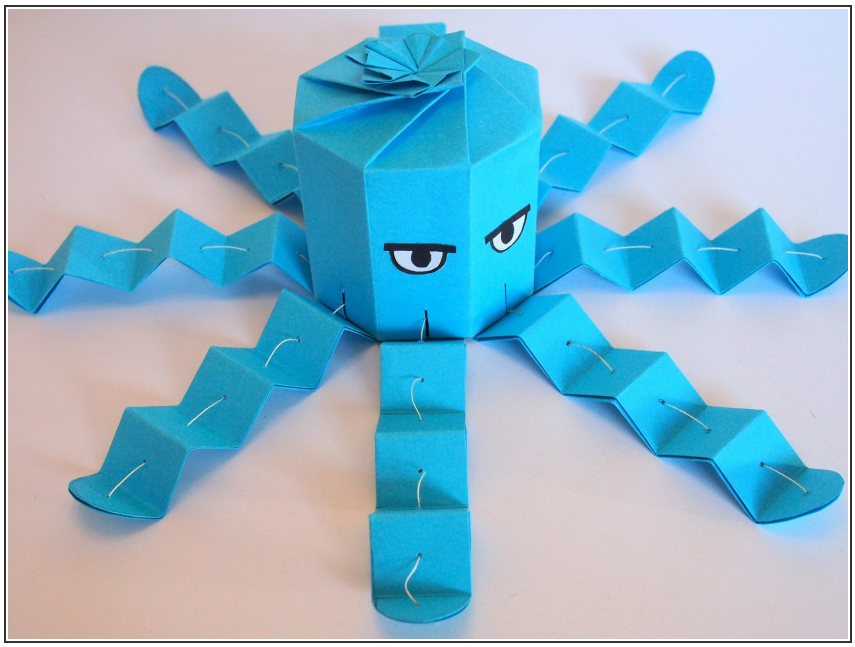
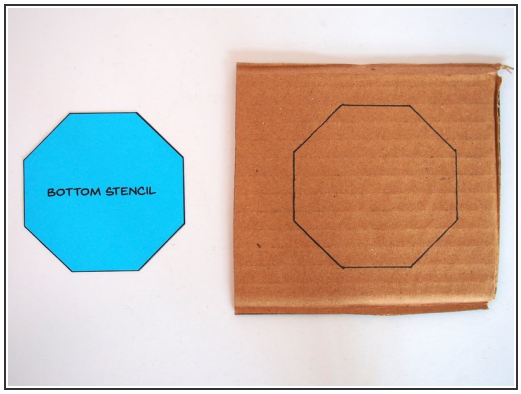
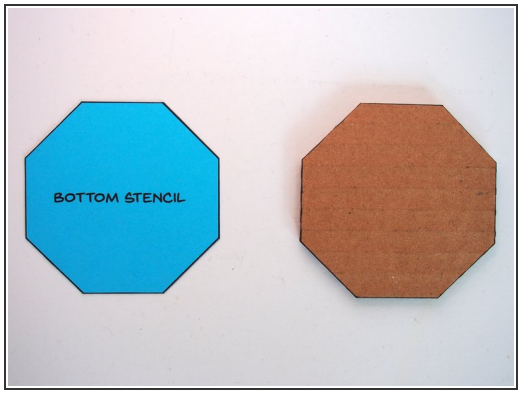
Step 9 — Alternative Body

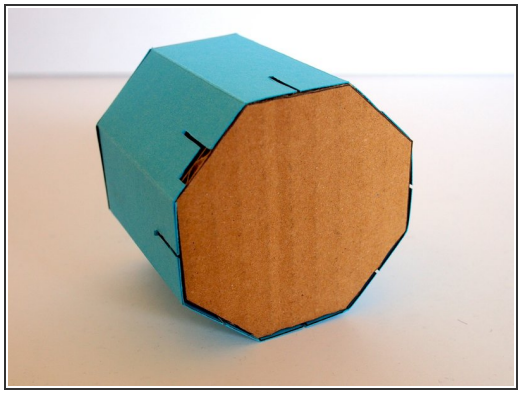


- If you're feeling up to a challenge, you can also make the body using the origami method, which results in the twisty-top on this Octobot
- I used the instructions here to create an Origami Octagonal Box: Origami Octagonal Box

Step 10 — Cut the Base

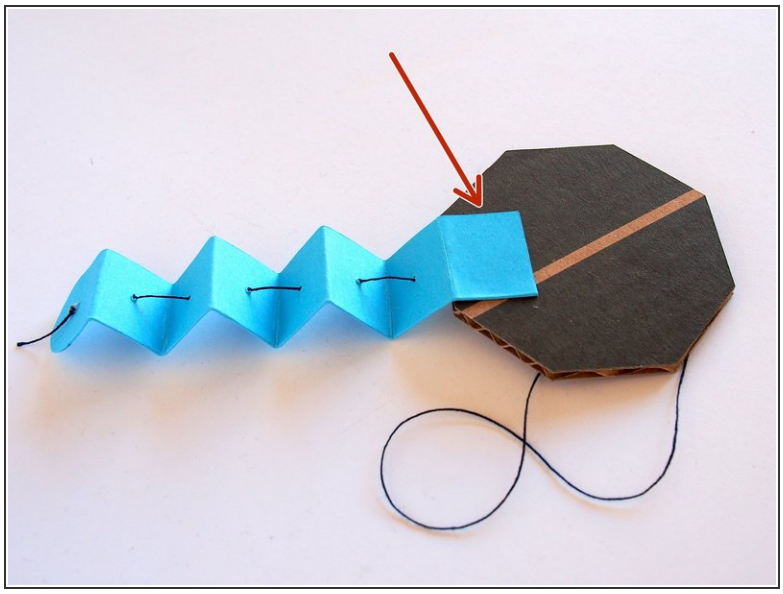


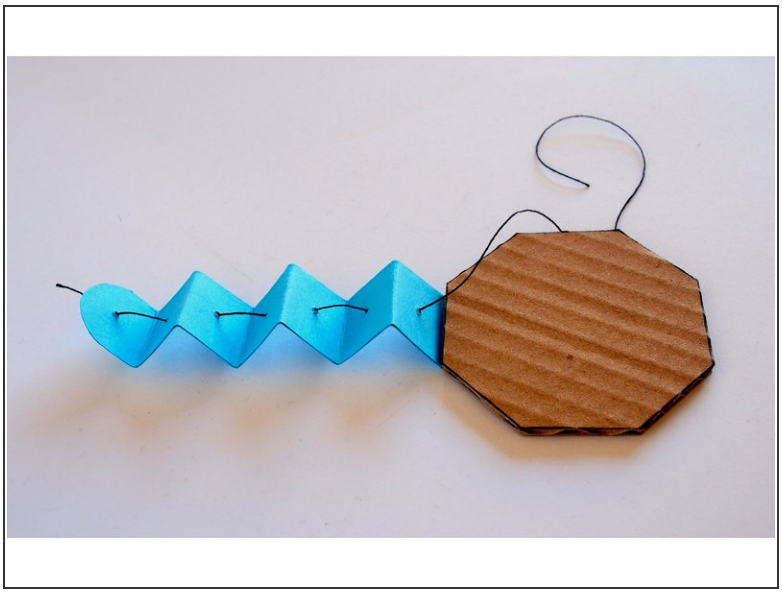




- Use the base stencil octagon to trace an octagon onto a piece of cardboard
- Cut the base octagon out of cardboard
- The base should be just small enough to fit inside the body (but not so small that there's loads of empty space around it)

Step 11 — Attach the Tentacles

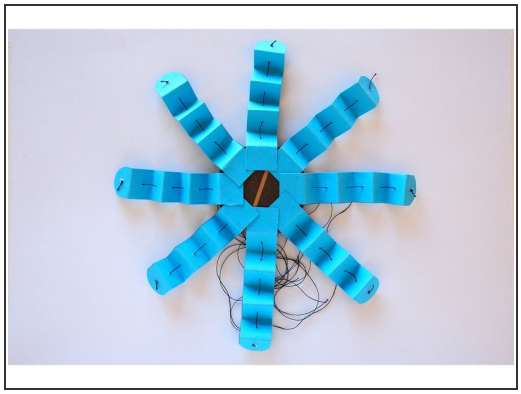


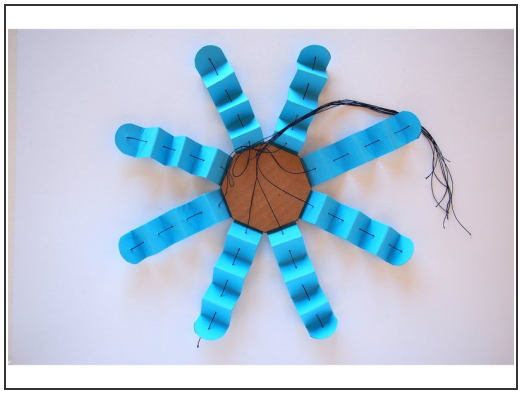


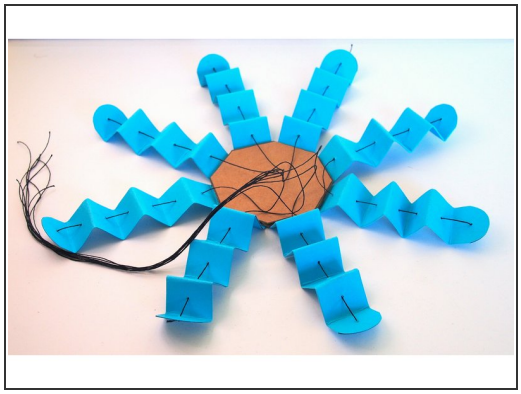
- Glue a tentacle to the bottom of the cardboard base
- Only glue the last folded section of the tentacle (the one without a hole)

⚠ Make sure the thread doesn't accidentally get glued to the cardboard

Step 12 — Add the Other Tentacles

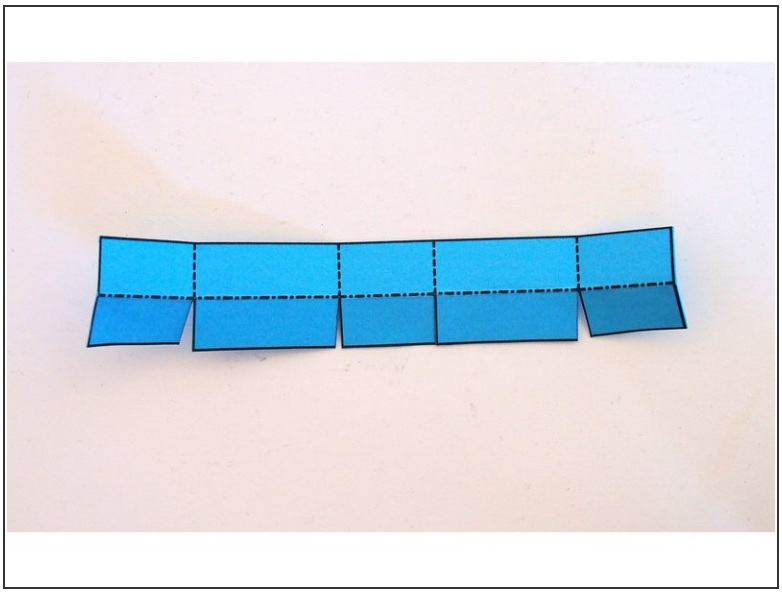


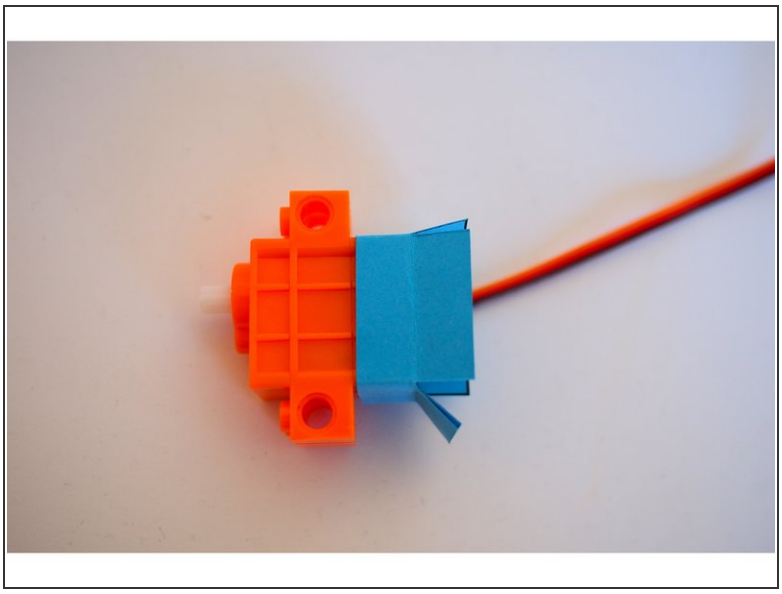




- Repeat for the other 7 tentacles
- Try to keep the threads from getting tangled

Step 13 — Make the Servo Holder

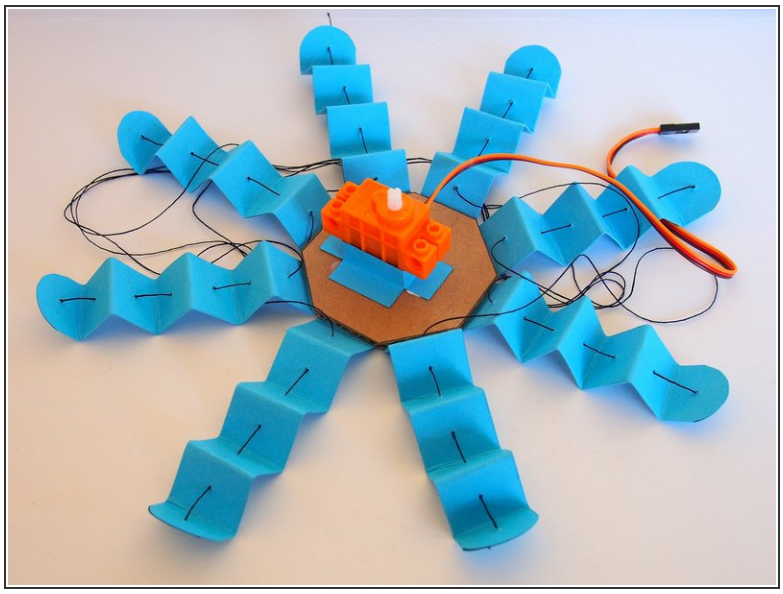


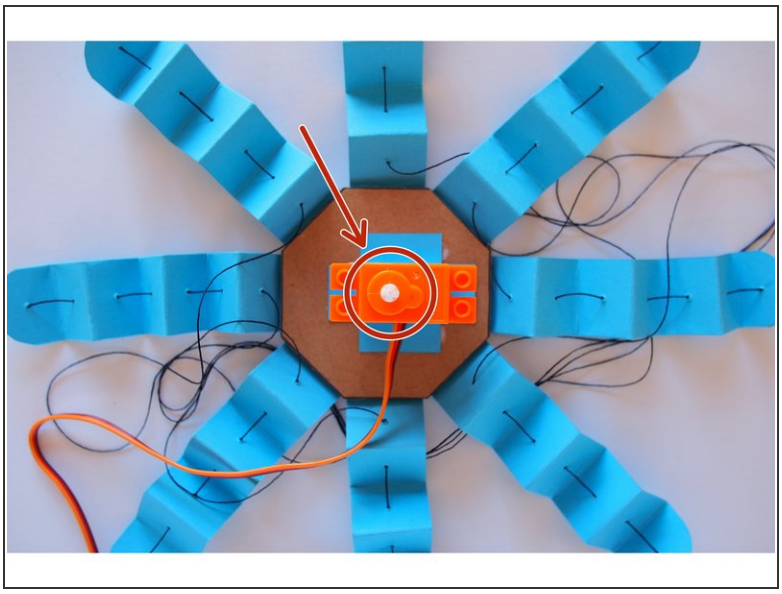


- Cut the servo holder template
- Fold the servo holder
- Glue it around the servo

ⓘ You don't need to glue the paper to the servo—just wrap the servo holder around the servo, and glue it where the two parts overlap

Step 14 — Attach the Servo

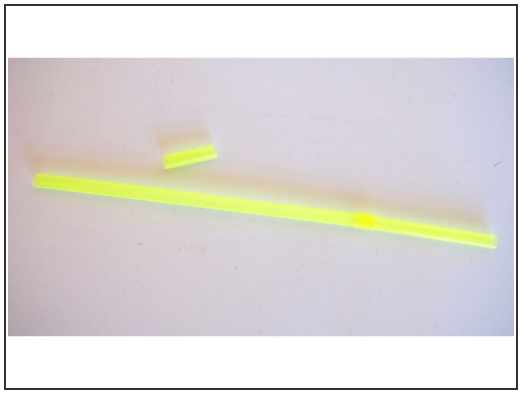


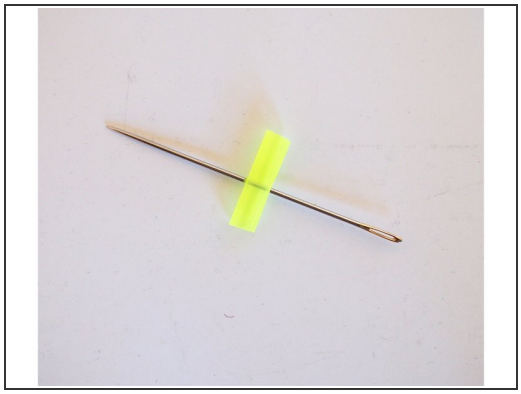


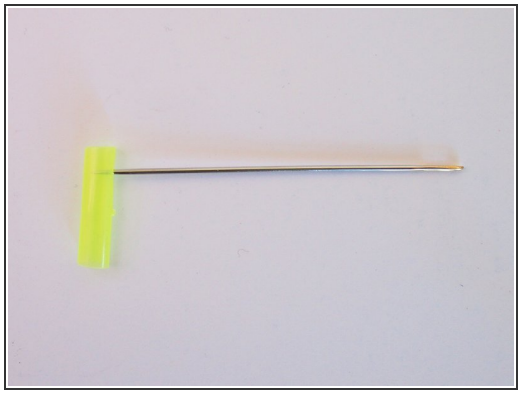
- Glue the servo holder to the cardboard base of the Octobot

ⓘ Note that the servo itself isn't centered on the body—the servo's *shaft* is what should be approximately centered

Step 15 — Making the Axle

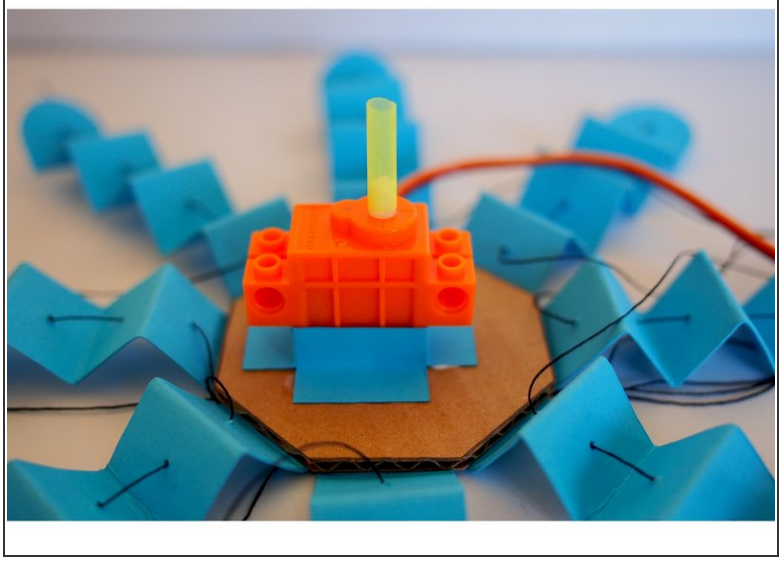


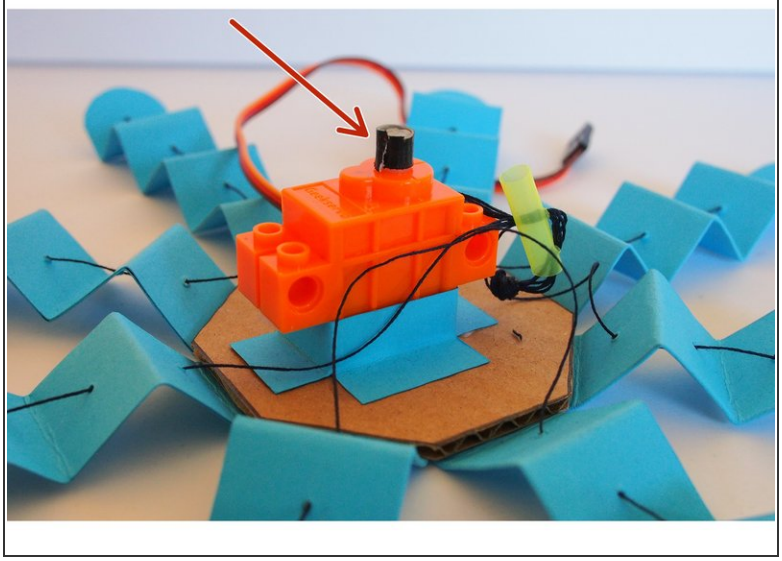




- Cut a piece of straw about 3/4" long
- Use the needle to poke a hole through the straw at about halfway between the top and bottom
- Poke another hole (this one only needs to go through one wall) close to the top of the piece of straw

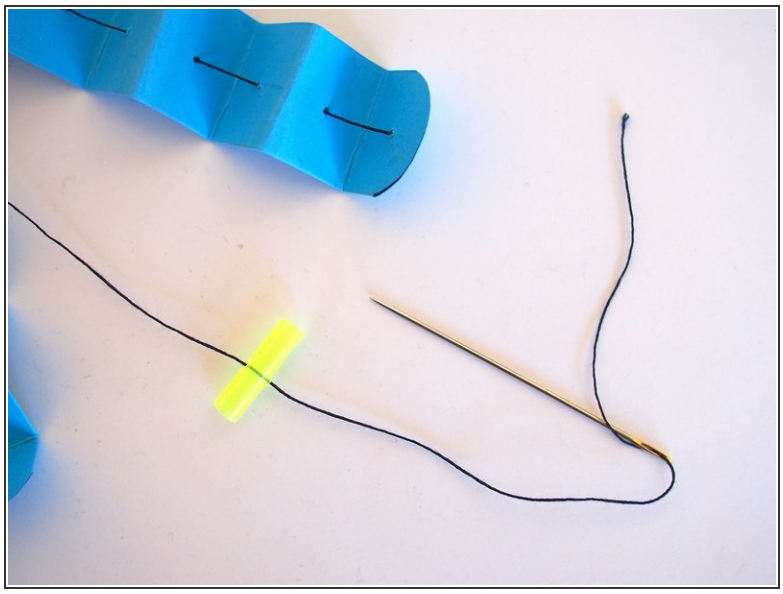
Step 16 — Check the Straw Size

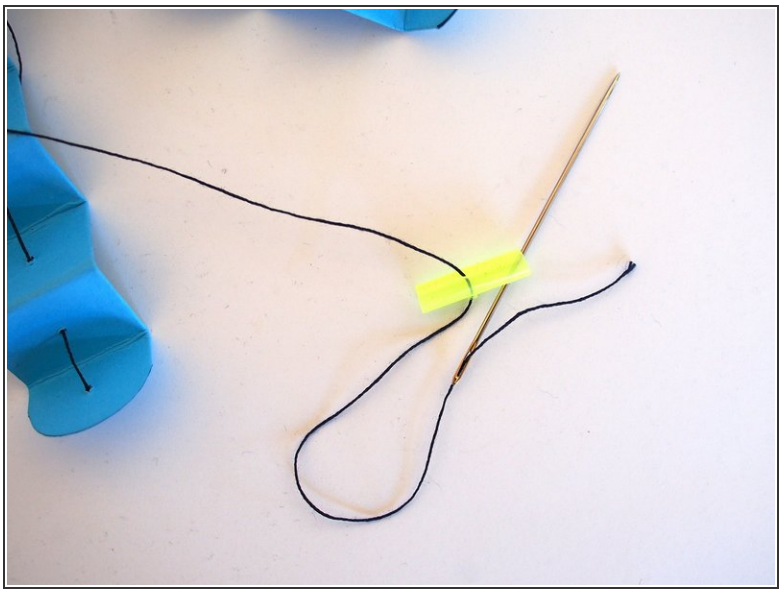




- Put the straw onto the servo shaft
- Since straws come in all different sizes, it may be too big. If that's the case, put a very small piece of tape around the servo shaft to increase its diameter
- The straw should fit snugly on the shaft

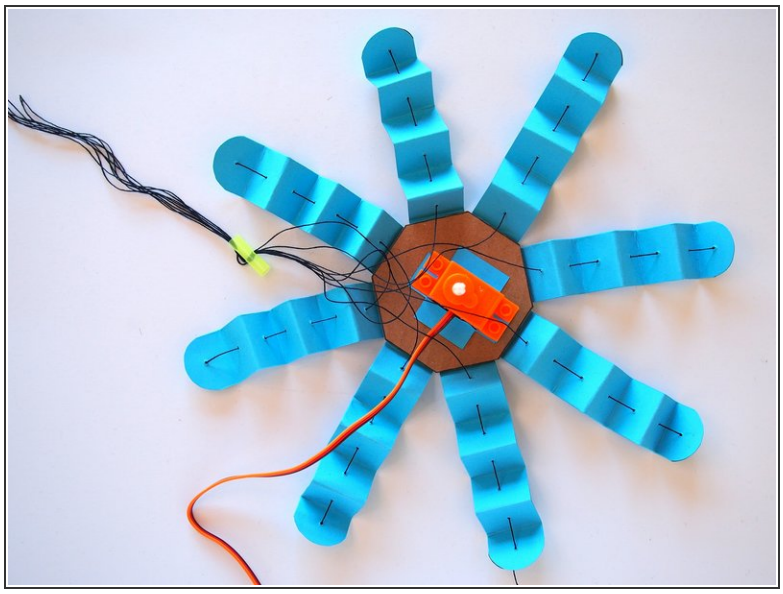
Step 17 — Attach the Thread

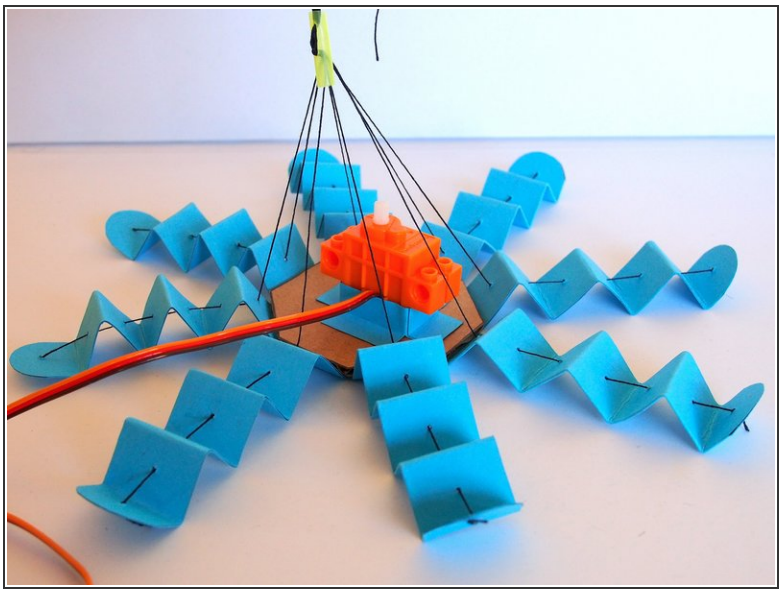




- Sew one of the pieces of thread onto the straw
- First go through the middle holes, then up out the top

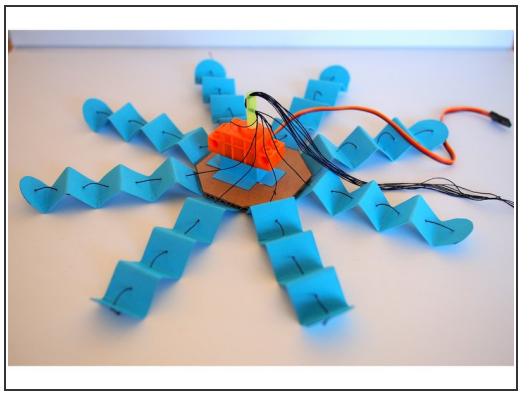
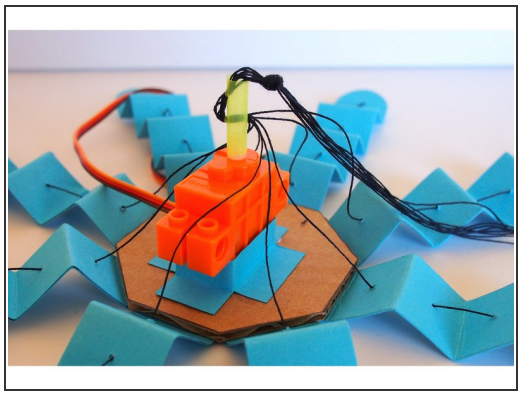
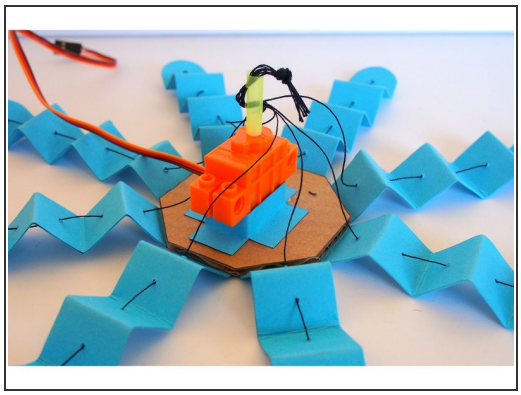
Step 18 — Do It Again





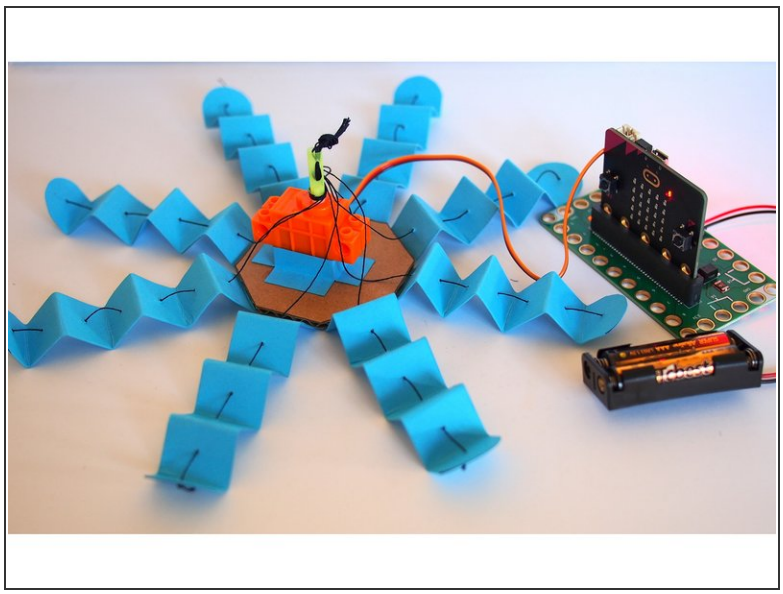
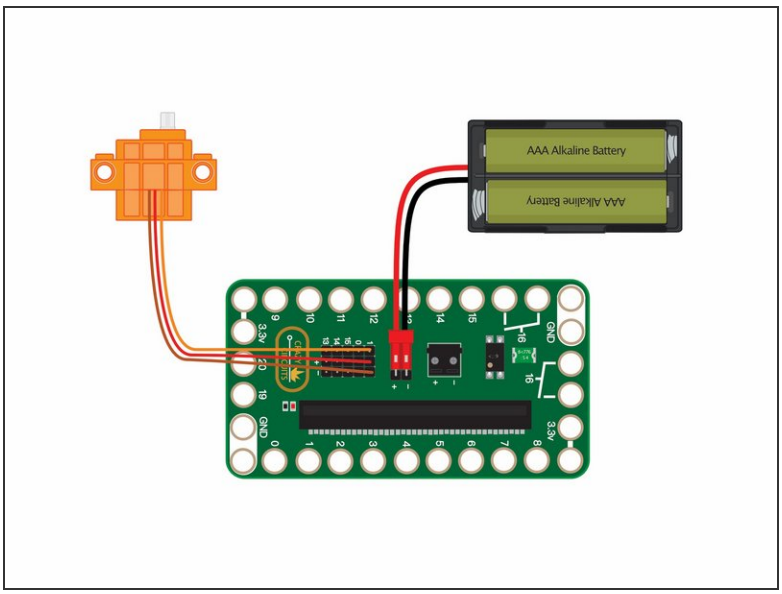
- Repeat this 7 more times until all 8 pieces of thread are sewn into the straw
  - ⓘ It's best to do this one piece of thread at a time to avoid them getting tangled or twisted
- Check that the length of the thread between the straw and the tentacles is roughly the same
  - You can check this by pulling the piece of straw up to check that the threads are all roughly the same tensions

Step 19 — Attach the Axle

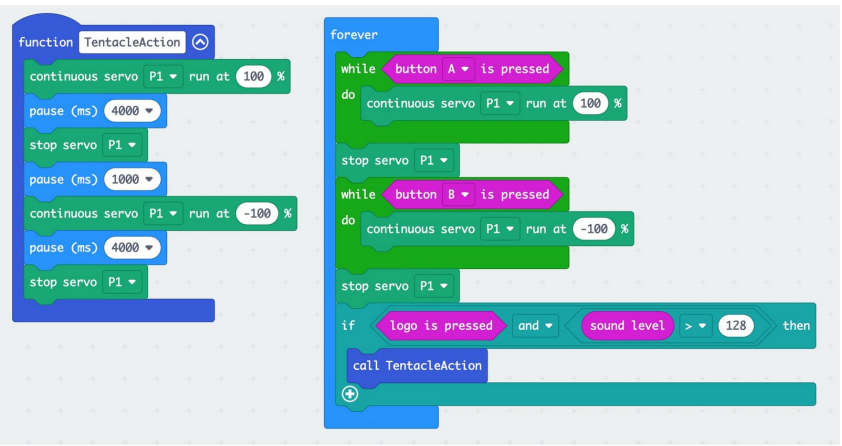
- Push the straw to the servo shaft, making sure it's snug (if it's loose, the shaft will just spin inside the straw without turning the straw itself)
- Make sure the tentacle are all fully extended, then tie a big knot where the threads exit from the straw
- Trim the extra thread

Step 20 — Connect the Circuit

- Connect the servo to the Bit Board at Servo Pin 1

Step 21 — Upload the Code

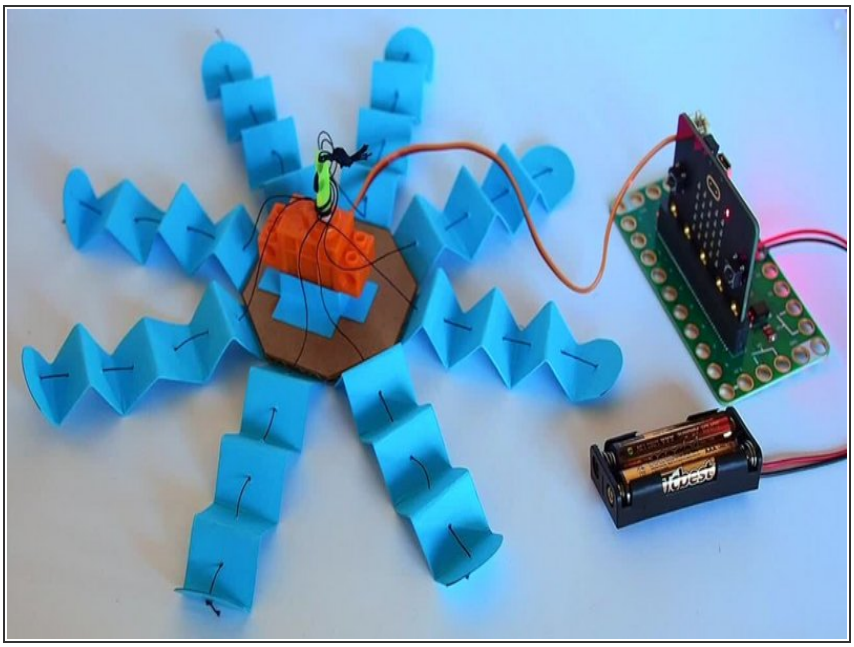


- Upload the code from here: [Octobot Code]

- You'll note that the sound activation requires touching the logo at the same time. That's to avoid accidentally triggering it if you're in a noisy environment. You can change that by getting rid of the "logo is pressed" block

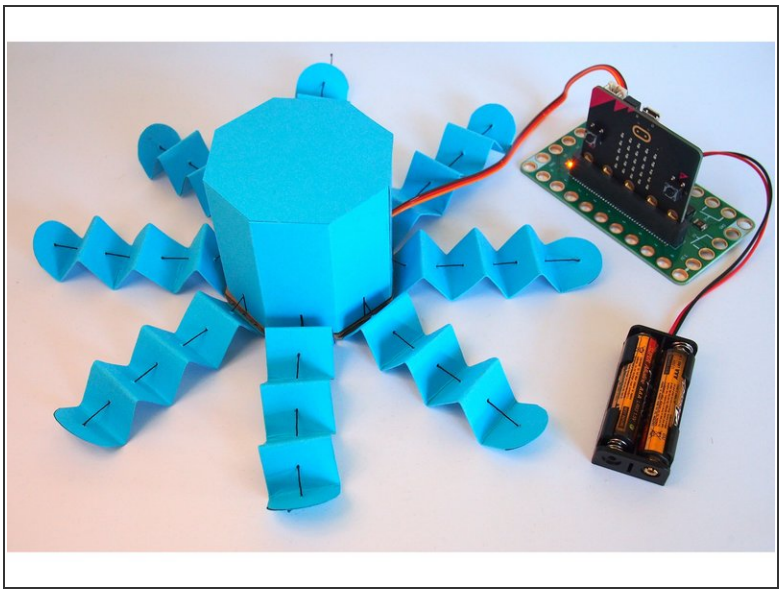
ⓘ The sound trigger requires using the micro:bit v2. If you don't have the v2, there's loads of other ways you can trigger the Octobot, such as using the accelerometer to shake the micro:bit, or making it light-sensitive

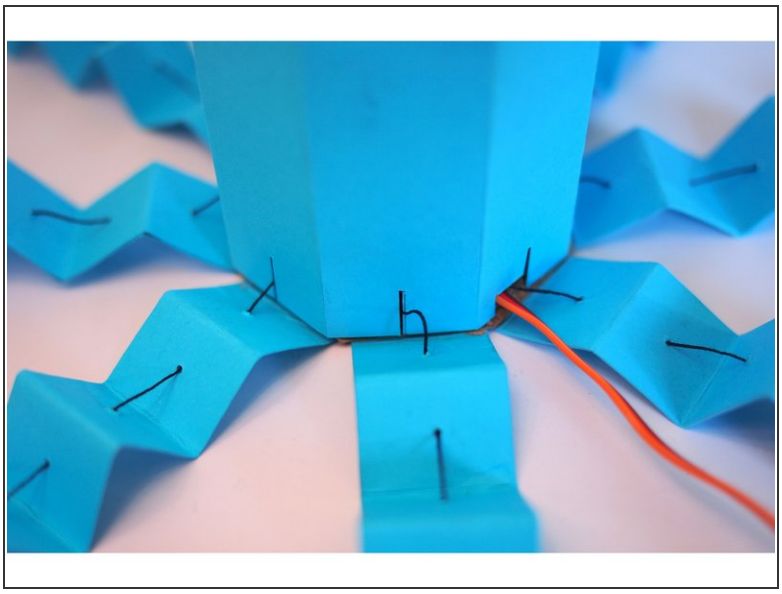
Step 22 — Test It



- It's easiest to test the mechanism while the servo is still exposed
- Use the A and B buttons to try retracting and extending the tentacles
- Tip: For the TentacleAction function, try playing around with the timing and speed to get different effects
  - Depending on how loose the threads are, you may need to pre-wind the threads around the axle by using the A button before triggering the TentacleAction function

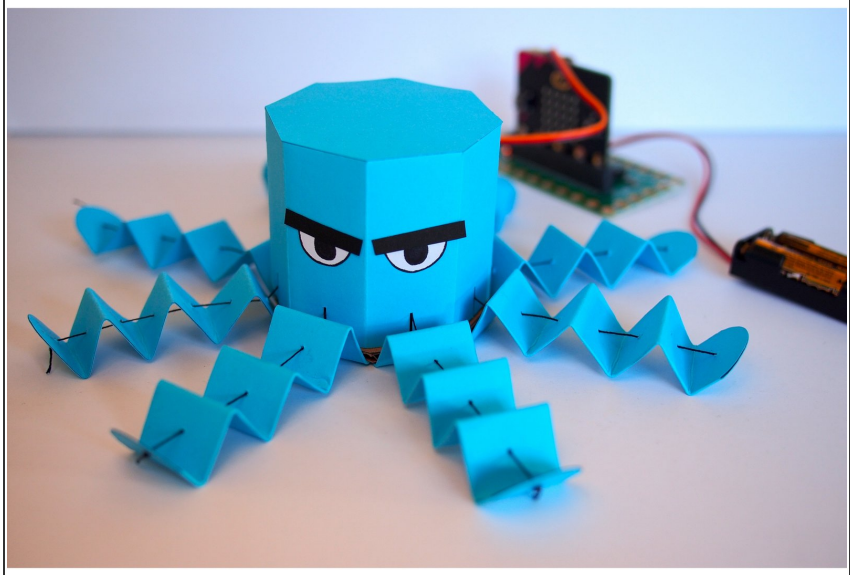
Step 23 — Put the Body On





- Put the body on
  - The thread should slide into the thin cutouts in the body
  - The servo wire should go through the larger cutout
- Optional: You can add a bit of glue to secure the body to the cardboard base (I didn't in case I wanted to access the inside)

Step 24 — Give it a Face



- Give your Octobot a face!
- Touch the logo and shout "BOO!" to make Octobot retract its tentacles!