

Mechatronic Mascots



What you make and build - engineering - isn't just about the problem you're trying to solve, it's about you. What you build can tell people who you are and what kind of world you want.

Today we're building with **mechatronics**. Mechatronics can do a lot of really cool things, but we also like to think about what electronics and mechanisms can say. Mechatronics (and other things you build) are a media - like painting, or writing, or social media - that you can use to tell stories..

In this activity, you'll craft a **crank-powered machine**, but also a **narrative** - about who you are, about what you care about, and what you want the world to be like. Narratives are like stories, but sometimes they are stories that are invisible, or that you don't know you're telling.

We're going to make a **mascot**. Oski the bear is the mascot of UC Berkeley. What does UCB want to tell you about itself?

With this mascot?



What about [this](#) one?



STEP 1: Sketch your mascot

What you want to tell about who you are, what you can do, and what you dream about? Try to quickly sketch 2 or 3 ideas.

Next, pick one idea and do a second sketch, trying to think about how it might look or move with the crank mechanism. For ideas, visit [papermech.net](http://www.papermech.net/modules/crank.php)'s crank simulator for ideas.

<http://www.papermech.net/modules/crank.php>

Try to "spec" your sketch with information like the dimensions of important parts, and how you want each piece to move (how far, how fast) or how you want it to feel (happy, strong, wiggly).

PAPER MECH

Tools

- Scissors and/or x-acto knife
- A skewer or nail
- Wire cutter or strong scissors for cutting lollipop stick or skewers

Craft

- Crank Mechanism Parts Cards
- 2 or 3 lollipop sticks
- Glue
- A few rubber bands
- Paper, foil, etc. for decorating

Electronics

- None required

Key terms:

Mechatronics; Input; Actuation; Narrative; Crank; Linkage

What is mechatronics?

Mechatronics is a hybrid of mechanical, electrical, and computer engineering. It uses computer programs and digital **inputs** to control, or **actuate** mechanisms that make things move. Inputs can include data from a sensor or signal from a button. Mechanisms can involve gears, pistons, pulleys or all the above. Mechatronics can be as complicated as an arm that repairs spaceships, or as simple as the spiral that drops chips or a soda can when you put coins into a vending machine.

Paper Mechatronics is a new design medium that integrates traditional papercrafts with mechatronics. It allows inquiry, storytelling, and creative inspiration to drive the design process and makes possible a craft-oriented and learner-centered approach to engineering and computing education.

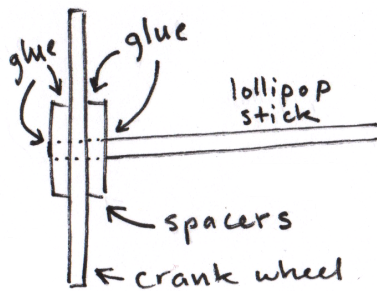
More help

Join the GiE session and please don't forget to ask for help.



Step 2: Build your mechanism

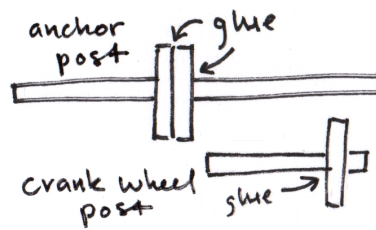
1. Build your crank wheel



Assemble spacers and crank wheel as shown here, with the lollipop flush with the outside spacers of the crank wheel.

You may not need the outside spacer.

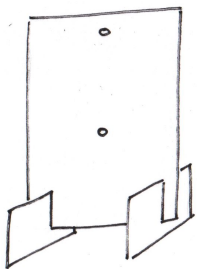
And posts for your linkage



On the crank wheel post, the length of the lollipop stick should be a little less than the width of your crank wheel +

spacer. If you don't want to add washers to your crank wheel post, install it directly to the wheel (step 3)

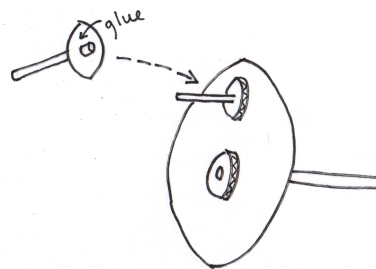
2. Create the base or backboard



Put the backboard into the slots in the two "feet" and stand up your crank mechanism base.

You can also turn the backboard sideways.

3. Install crank wheel linkage post

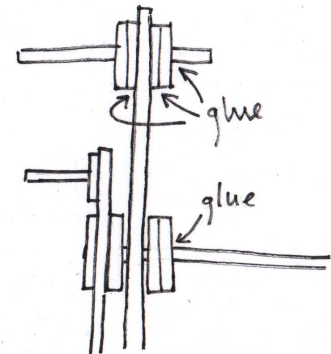


Put glue on post and washer, then place it into one of the holes in crank wheel. You can install without a washer if you want to.

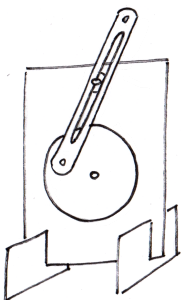
4. Install the crank wheel & anchor post

Push the crank wheel axle through the center hole of your base. On the back, push the washers in until they are snug, but not tight. It can help to add a paper spacer between the crank wheel and base. Don't glue the washers or stick directly to the base - you want these to turn smoothly. Next, select a hole and add the anchor post. You can glue the washers directly to the base to add strength.

Prototyping Tip: Instead of glue, you can use rubber bands behind your washers while you figure out exactly where you want things.

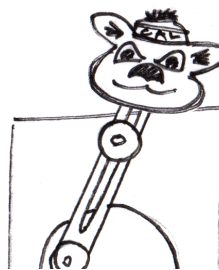


5. Add your linkage



Test to see how your linkage will move. You can try to a new anchor post location to see how that will change the movement. Add or adjust washers to improve alignment of your system. Then mount your linkage post and add washers to outside.

6. Add your mascot and other details



Create your mascot and add it to the top of your linkage, using tape or glue. Try it facing in new locations or try connecting arms or wings from the mascot to the base. You can also add decoration to the base to hide or accentuate parts of your mechanism.

See below (online edition) for more ideas!

Step 3: Reflect & Revision



Share your ideas, sketches and questions. Creations don't need to be finished - or perfect! - to share. Now that you see how things come together, how would you redesign your mascot and mechanism?

- How did your design change from the beginning to the end. What was unexpected and how did they respond? How did you figure that out?
- What did you learn about materials? Electronics? Gears? Narratives?
- What questions came up?
- What is working well? Where were you frustrated?
- What worked like you expected, or looked or moved like you hoped?

Step 4: Keep on going



- **Deepen your design.** Make a second sketch and improve or rebuilt your mascot and mechanism.
- **Create a [fable or myth](#), or “[fact sheets](#)”** about your mascot. What kind of adventure, mystery, or other story would your mascot be involved in? Write a story or draw a scene.
- **Change how your mascot moves.** Add a second linkage or make the linkage longer or taller.
- **Add a belt.** Like a car's fan belt, you can use a rubber band to power the drive shaft of your crank wheel. Use something around your house. Maybe try an old toy or powered tool to drive your mascot.
- **Add a microcontroller and [servo motor](#)** to drive the center wheel, or **create a [DIY CardBoard](#)**. Servos can power the mechanisms. Adding sensors or DIY switches can make mascots dynamic.



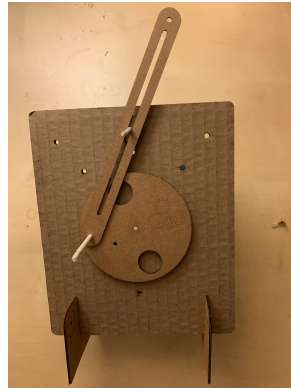
Assembly Photos

<p>Pop all the pieces out of your parts card</p>	<p>Create the base or backboard by putting the large piece into slots in the "feet"</p>	<p>Measure and cut 3 pieces of lollipop stick</p>	<p>Glue a washer to the back of your crank wheel</p>
<p>Add a small drop of glue to the center hole and install the longest lollipop stick.</p>	<p>The stick should be flush with the front of the wheel.</p>	<p>Select a hole for your linkage post, then add a small drop of glue.</p>	<p>Install the linkage post and let it dry. You might need another spacer on top to keep it steady.</p>
<p>Select a hole and install the crank wheel in the base.</p>	<p>Add a washer to the back of the base. Glue the washer to the lollipop stick, but not the base.</p>	<p>Select a hole for your anchor post and a little glue around it.</p>	<p>Install 1 or 2 washers at the anchor hole location. Line them up so a lollipop stick can pass through</p>

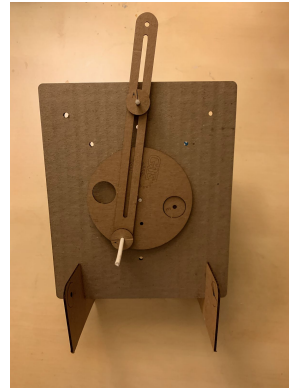




Put a small drop of glue inside the washers and install the anchor post. It should extend out the back far enough to install an additional washer.



Add the linkage. Test to see how it moves. You may want to try another anchor post location.



Add washers to the outside of the linkage. These should hold it in place, but not be too tight.



Test to see if the wheel can rotate and the linkage can move smoothly.



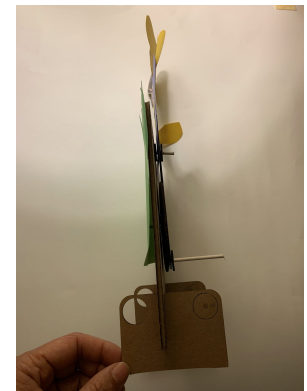
Create your mascot and tape or glue it to the linkage.



You can add it to either side of the mechanism, depending on how you want to drive the mechanism.



Check to see how the mascot moves and adjust the mechanism and decoration. Add more detail.



Side view of the Mechantronic Mascot.

