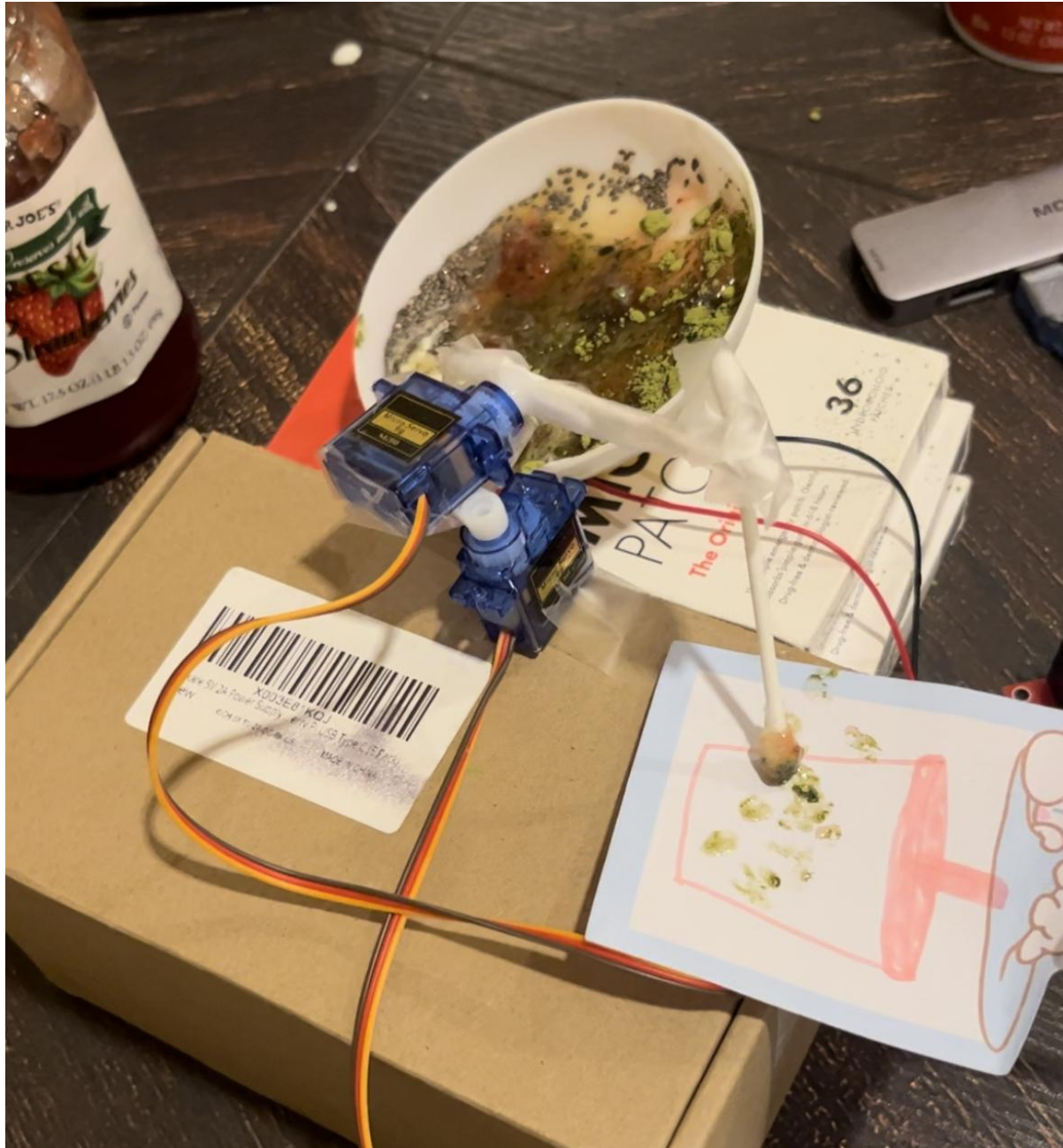


Boba Ink

By Rachel Quach



Project Description

Boba Ink is a robotic arm designed to transform everyday ingredients into works of art (in the form of boba)! Equipped with a dynamic mixing bowl, *Boba Ink* allows you to blend together a variety of ingredients from your kitchen, creating unique colors for your boba art. The robotic arm is designed to dip into the ingredient mixture and apply colorful dots onto your paper, mimicking the look of boba balls in a boba cup.

Showcase

Check out these links for my project demos:

- [Raw Demo \(No Ink\)](#)
- [Final Demo](#)

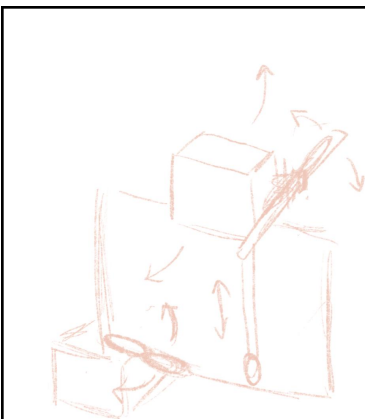
Process

Ideation/Design Process:



My ideation process initially started by looking through all of the example projects from class, and referencing other student projects to spark inspiration for my own project. I saw a lot of students used DC motors to incorporate spinning, and servo motors for more precise drawing movements. I was also really interested in creating a basic robotic arm that could draw / make marks, and was inspired by Sun Yuan & Peng Yu's *Can't Help Myself* robotic arm. I also thought the example *ArtBot* was a really unique way to integrate a motor and marks by having the cup "walk" and make art.

Thinking about what I could use to make markings, I didn't have paint on me, so I improvised by pulling out a bunch of kitchen ingredients and seeing which ones were pigmented enough that they could be used as ink. Since I decided I'd be using ingredients as ink, I thought it would also be cool to incorporate an "edible" aspect to this project, so I decided to incorporate the boba painting as a unique feature as well.



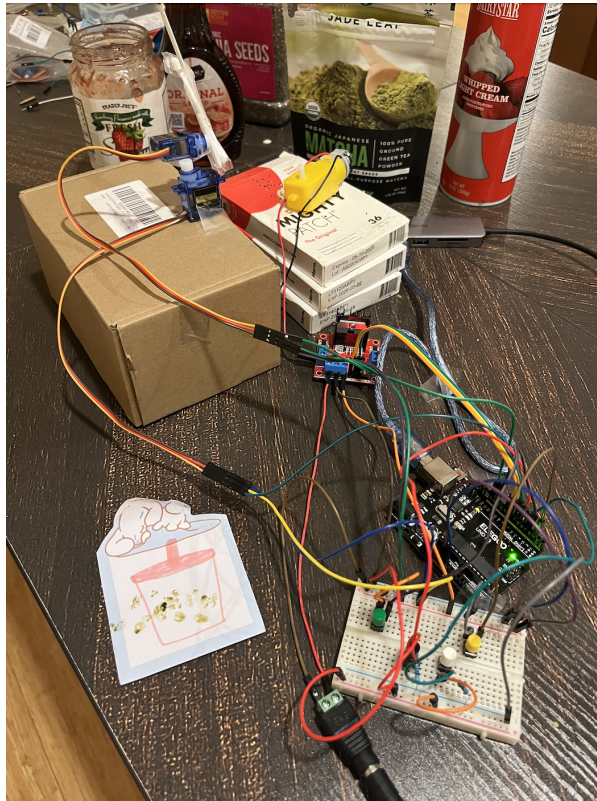
Here's an initial sketch I created where I wanted the robot arm to be able to move up/down and left/right using servo motors. I initially had a small box with a door that I planned to use to implement this, but later scrapped that idea since it became a little too complex, and I later just attached the servos to each other.



This is when I found blueberries in my fridge and thought about using it as ink by mashing it up (I forgot that blueberries aren't blue/black on the inside).

Prototyping/Building Process:

Getting the motors to work: - DC Motor Spin - Mixing Bowl Spin - Servo Motor (Connected to Potentiometer) - Servo Motor (Arm)	First, I worked on getting each of the motors to function how I wanted them to separately. For the DC motor, I just wanted this to spin a bowl on top of it. For the Servo Motor, I wanted this to initially move the robot arm left and right by using a potentiometer, but this became really buggy so I eventually switched to buttons to control turning it left or right. For the Servo Motor controlling the arm, I just wanted this to toggle up or down when the button was pressed.
Buggy Potentiometer Servo	The potentiometer was really buggy, and I couldn't figure out how to make really precise movements, so I later switched to buttons.
Raw Demo	This is the demo of the robot arm without actually picking up any ink. It's able to turn left/right, move up/down, and spin the mixing bowl.



This is all the wiring and components I used for the project.

Conclusion / Reflection

I'm happy with how my project turned out and enjoyed being able to incorporate a boba aspect into my project. Throughout the process of making this project, I learned a lot about how motors work and how to use code to make something tangible and interactive. I thought that the wiring and connecting all the components together would be a lot more complex, but it was a lot simpler than I thought. There was a lot of problem solving involved to get the project to finally work as intended, but working through the process allowed me to gain both technical skills while also being able to incorporate my own creativity into an art piece.

If I could do this project over again, I would definitely work on wiring a lot cleaner, because it became really difficult to debug my circuit with so many motors, buttons, and other inputs all wired onto the same breadboard. I would also use a more distinct stamp rather than a q-tip, since there wasn't a lot of surface area for the q-tip to absorb any of the liquid ingredients and didn't show up that well on the boba drawing. I would also definitely place the motors a lot more securely, since they were constantly moving out of place and disconnecting parts of my circuit, which also made it difficult to debug any issues and make sure all the wires were still connected.

Links

Code	Arduino Sketch
Raw Demo (No Ink)	Video
Final Video	Video

Sources

Arduino Tutorial (H-bridge Motor, Servo Motor, Buttons, Potentiometer)	https://github.com/loopstick/ArduinoTutorial?tab=readme-ov-file
Controlling a Servo Motor w/ a Button	https://www.youtube.com/watch?v=zKALyCyfv5E
Controlling a Servo Motor w/ a Potentiometer	https://www.youtube.com/watch?v=QbgTl6VSA9Y
ChatGPT	Debugging help