

## Introduction

Over the summer, I worked in Professor Culbertson's lab with my lab partner, Smriti Wadhwa, for our research project. Our research project was about developing a way to research haptic mechanisms, and how it plays a role in fidgeting, using a fidget cube as our model throughout our project.

## Objective & Impact of Prof. Culbertson's Research

The objective of professor is to use haptics in ways that can benefit people. Haptics is technology that simulates the sensation of touch. The research can greatly benefit those with Autism Spectrum Disorder, ADHD, or general hyperactivity, by gathering information that can be used to help these people.

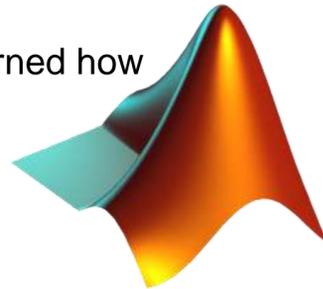
## Method

We developed a fidget cube prototype with an Arduino controller and a variety of different sensors that measure the amount, intensity, duration, and type of fidgeting that the person is doing. The goal was to track the actions made while using a fidget cube in order to determine what types of fidgeting is more common and how this can affect the design of other fidget toys.

## Skills Learned

While doing this research, I learned several skills in different programming languages including:

**MATLAB**, in which I learned how to plot data and create professional graphs and models.



**Arduino**, where we used sensors and circuits to measure inputs and output the data. My favorite part here was learning about how to make an Arduino circuit work, and I even started making some of my own Arduino circuits.



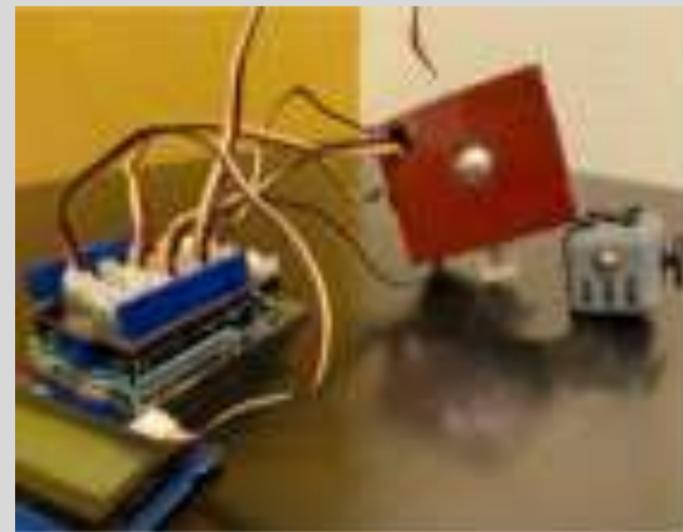
As our lab developed our physical **prototype**, I learned about the process of making a model for our fidget cube. We made a large cardboard cube with slits for the Arduino Uno and the sensors in order to measure all of the inputs, which gave me an idea about how rough and non-refined a prototype can be.

The inputs on the fidget cube were:

- Button
- LCD
- Buzzer
- Touch sensor
- Potentiometer
- Keycap

## My STEM Coursework

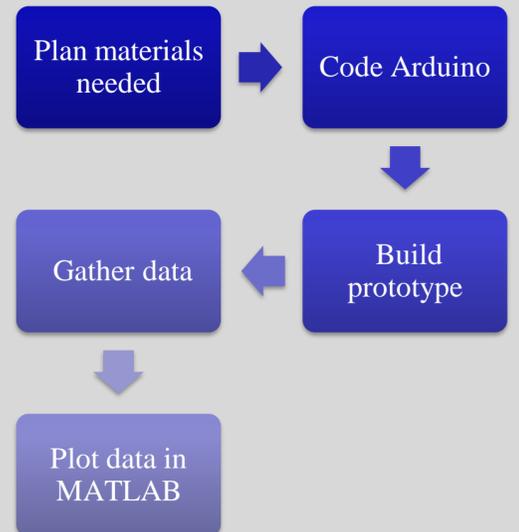
This project relates to our STEM coursework because it involves an application of technology such as Arduino and Matlab, as well as an understanding of circuits, which were required to measure the inputs coming into the Arduino Uno.



Fidget Cube prototype  
PC: Smriti Wadhwa

```
void loop()
{
    if (digitalRead(3)==HIGH)
    {
        delay(100);
        counter++;
        lcd.clear();
        lcd.print(counter);
        digitalWrite(6, HIGH);
        delay(100);
        digitalWrite(6, LOW);
        Serial.println(counter);
    }
}
```

Snippet of Arduino Code  
PC: Saamarth Sethi



## Next Steps

The next steps for this project is to make the prototype a lot smaller, by possibly using an external Arduino as opposed to an internal one and by using more high quality materials in the construction of the next prototype.

## Acknowledgements

I would like to thank Professor Culbertson for giving me the opportunity to work in her lab, Nagmeh Zamani for being a super helpful PhD mentor, my lab partner Smriti Wadhwa, Dr. Katie Mills for her guidance, and Cassandra Jeon for being an awesome Center Mentor.