



PIKA POWER

Zaeracana Carino

Tee Nguyen

Daria Orlova

De Anza Summer 2020

Engineering 10





Zaeracana
Carino

- Overall Visual Design
- Final PowerPoint



Tee
Nguyen

- Metal Structure Welding
- Overall Final Coding



Daria
Orlova

- Overall Final Coding
- Final Pika Power Construction



TEAM ROLES

Zaeracana Carino – Pikachu Design, Tilt Sensor Coding, Overall Visual Design, Final Construction

Tee Nguyen – IR Remote Coding, Metal Skeleton Build, LED Coding, Motor Coding, Final Construction

Daria Orlova – Speaker/SD Card Coding, Wire Soldering, Overall Code Structure, Final Construction





PROBLEM

- COVID – 19
- Negative impact on Mental Health of Adolescence (10-24 yrs old)
 - 3 times more prone to have a depression
 - **Limited or lack of human interaction**





SOLUTION

- Therapeutic toys helps to meet love and belongings needs

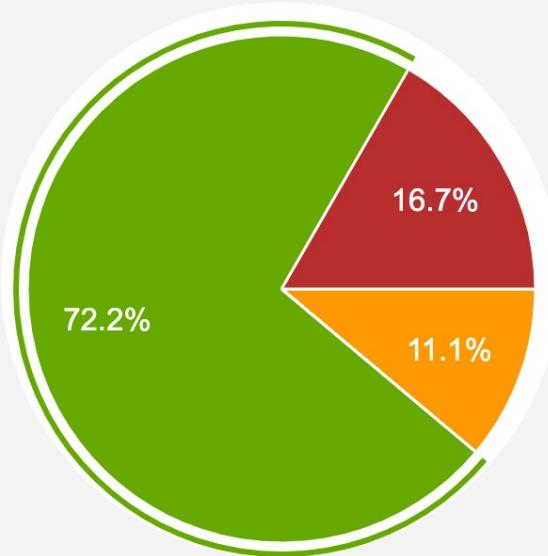


- Interactive toy

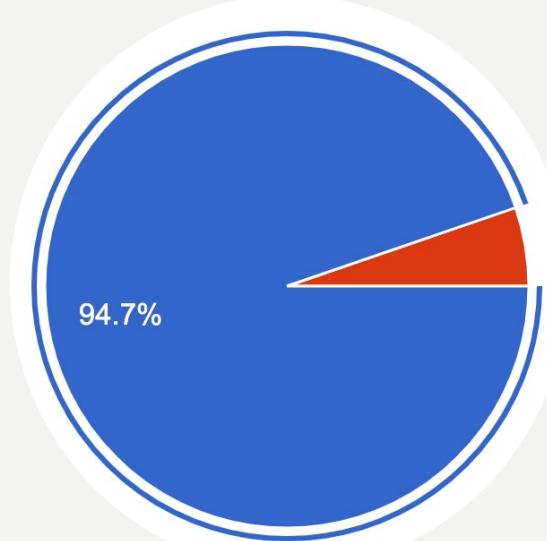




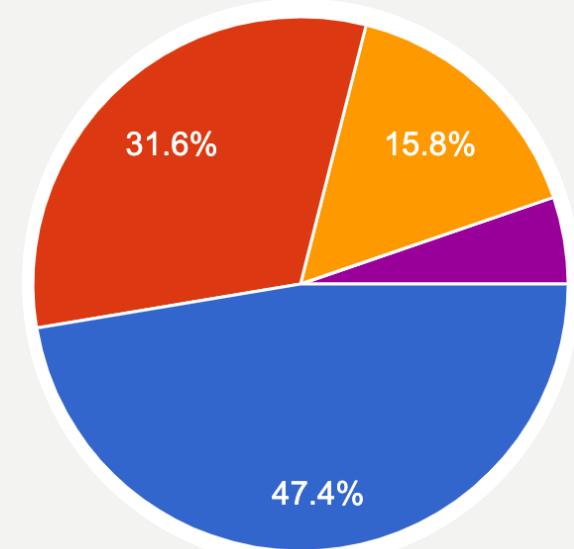
AGE



STUFFED ANIMAL



LOCATION

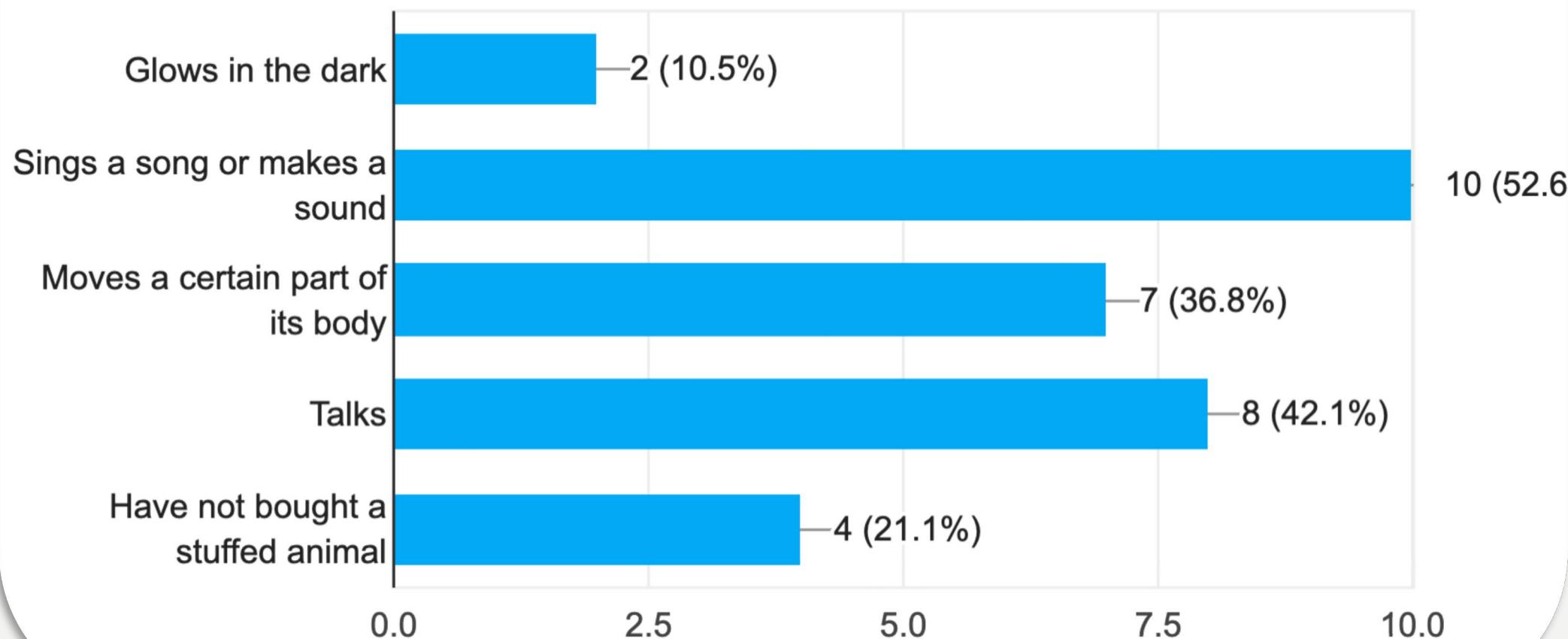


SURVEY ANALYSIS



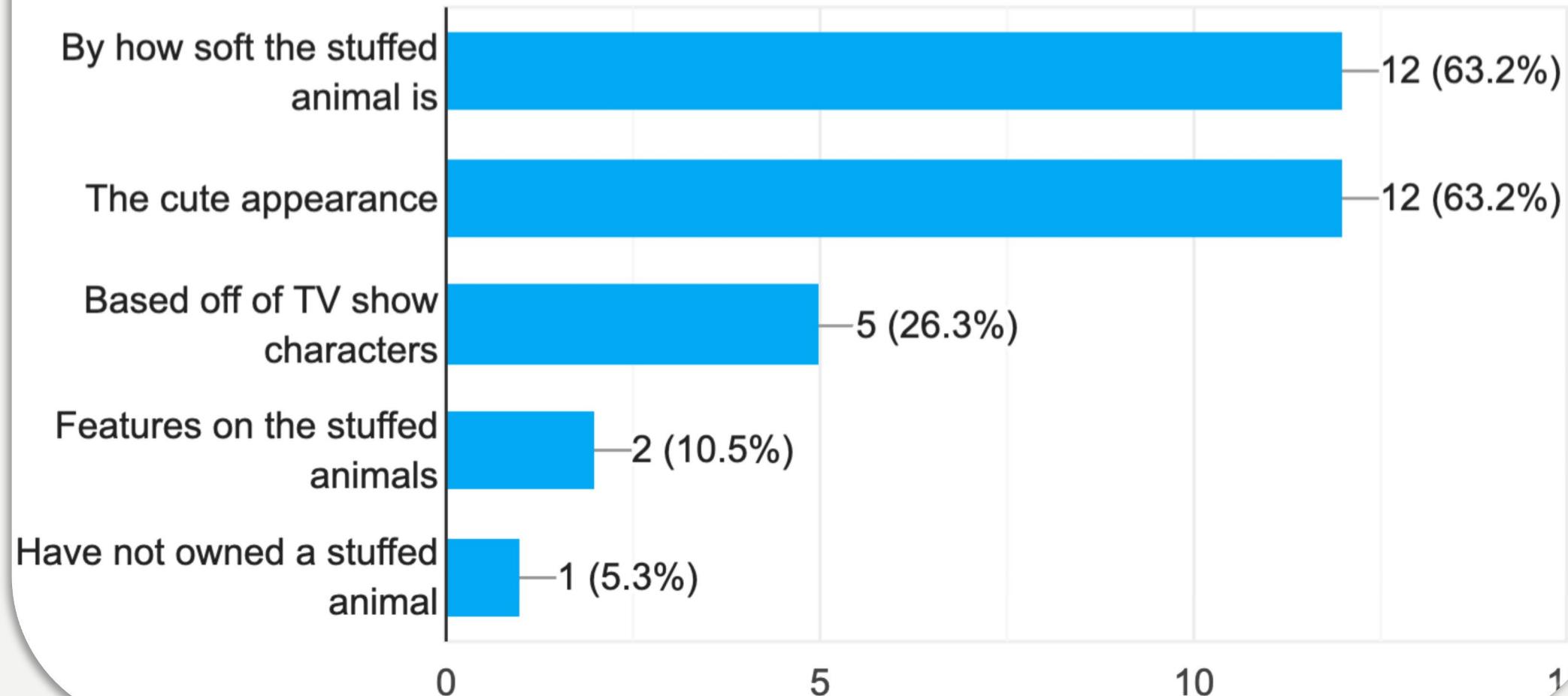
Have you ever bought a stuffed animal that: (Check all that apply.)

19 responses



How do you choose your stuffed animals? (Check all that apply.)

19 responses



HUMAN FACTORS

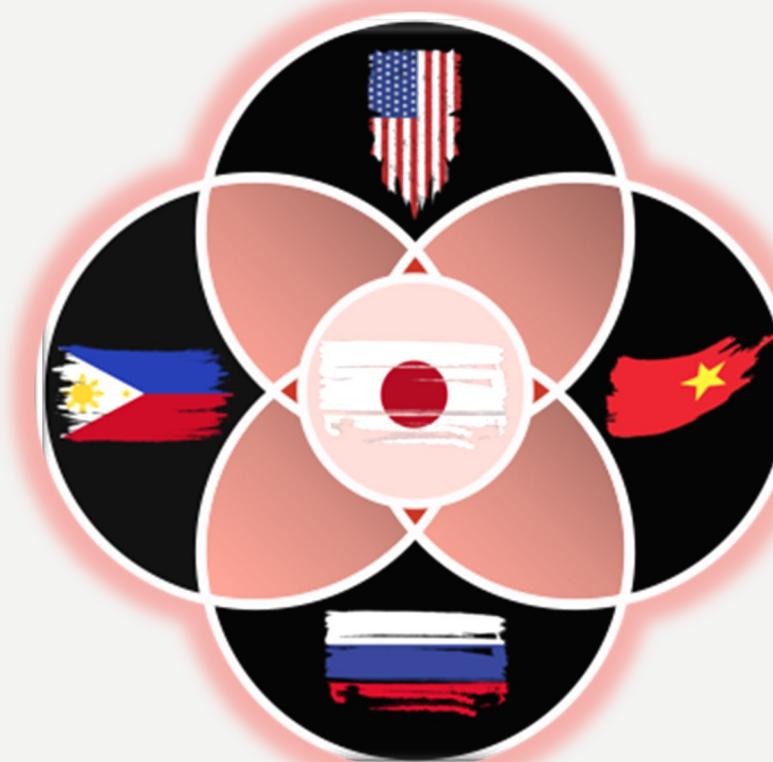
- Social Human Factor

- Mental Health



- Cultural Human Factor

- Cultural Background

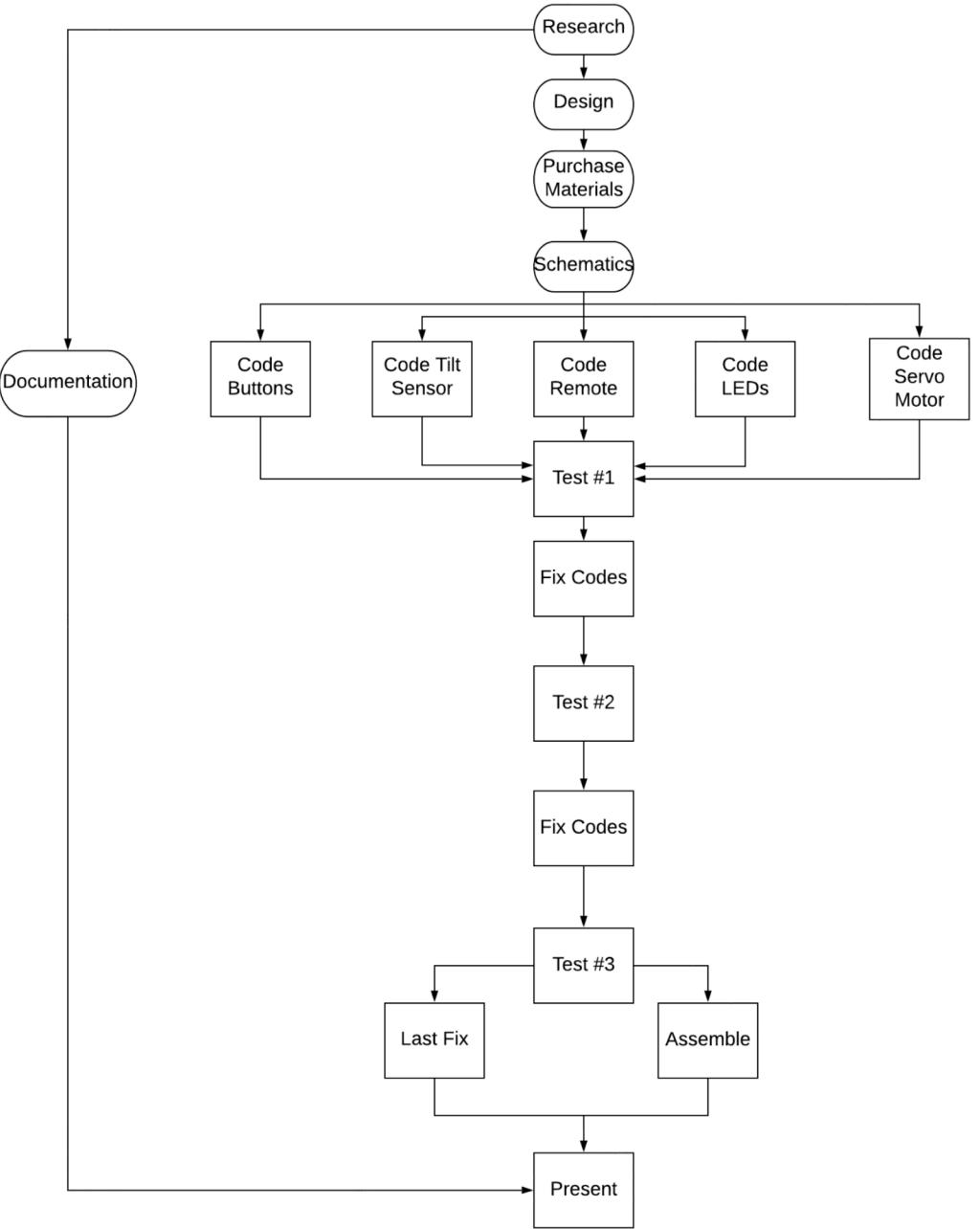




TIMELINE



Pert Chart



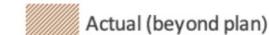
Pika Power

Period Highlight: 28 

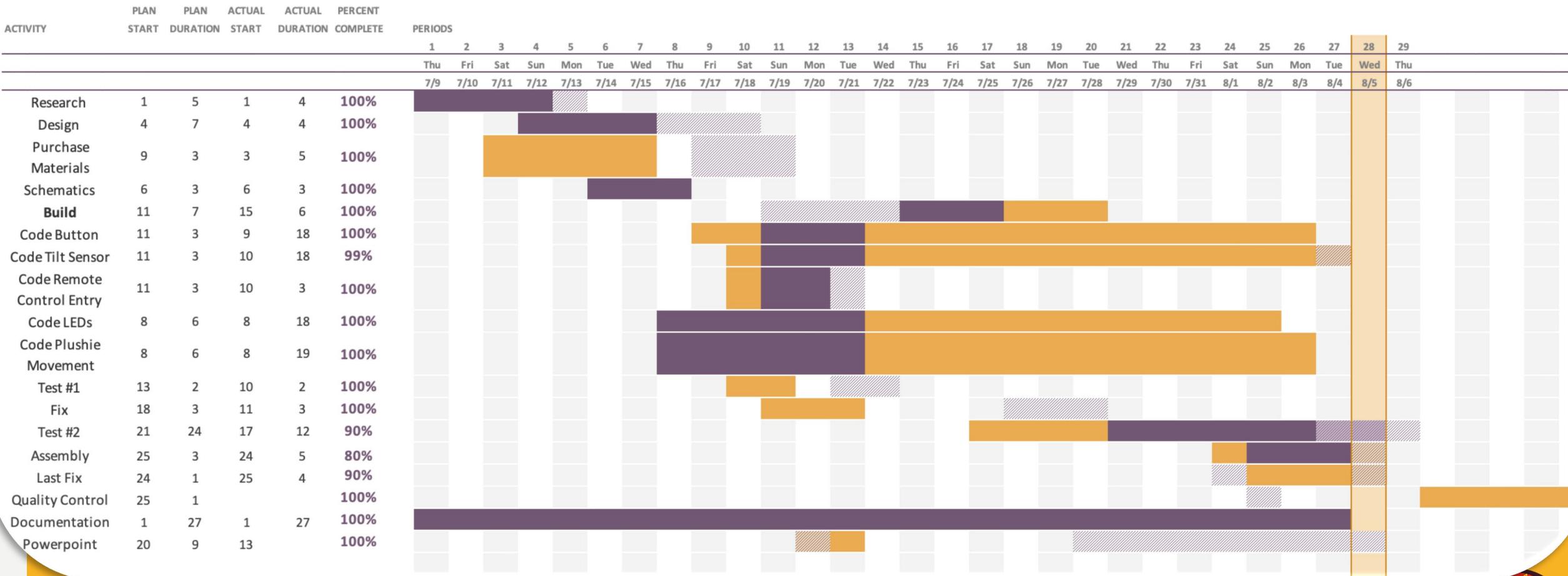
 Plan

 Actual

 % Complete

 Actual (beyond plan)

 % Complete (beyond plan)



PURCHASING CHART

Materials	Ordered By	Order Status	Delivery Status	Links	Quantity	Price per item	Total Price
Super Starter Kit UNO R3 Project (Arduino Uno Kit)	Zaera, Daria	Purchased	Delivered	Arduino Kit	2	\$40.41	\$80.82
Most Complete Arduino Uno Kit	Tee	Purchased	Delivered	Arduino Kit Complete	1	\$57.90	\$57.90
Pikachu Plushie	Daria	Purchased	Delivered	Pikachu Plushie	1	\$9.99	\$9.99
LM386N-3 Semiconductors (5-pack)	Daria	Purchased	Delivered	Audio Amplifier	1	\$8.50	\$8.50
8ohm 0.5watt Mini Metal Speaker (4)	Daria	Purchased	Delivered	Speaker	1	\$1.95	\$1.95
Virtuabotix SD Card Reader/Writer	Zaera	Purchased	Delivered	SD Card Reader	1	\$5.29	\$5.29
16GB SD Card	Zaera	Purchased	Delivered	SD Card	1	\$4.99	\$4.99
Popsicle Stick Pack	Zaera	Purchased	Delivered	Popsicle Sticks	1	\$7.64	\$7.64
LED's (100 Pack w/ Resistors)	Daria	Purchased	Delivered	LED Lights	1	\$9.00	\$9.00
Galvanized Steel 15"x1.5"	Tee	Purchased	Delivered	Home Depot	1	\$8.31	\$8.31
Galvanized Steel Plate	Tee	Purchased	Delivered	Home Depot	1	\$9.65	\$9.65
Total							\$204.04
<hr/>							
Tools							
Solder Kit	Daria	Pre-Owned	N/A	-	1	\$0.00	\$0.00
Glue Sticks		Pre-Owned	N/A	-	3	\$0.00	\$0.00
Tape		Pre-Owned	N/A	-	3	\$0.00	\$0.00
Pro-Spot Welder	Tee	Pre-Owned	N/A	-	1	\$0.00	\$0.00
							\$0.00
Total							\$0.00
Total Cost							\$204.04



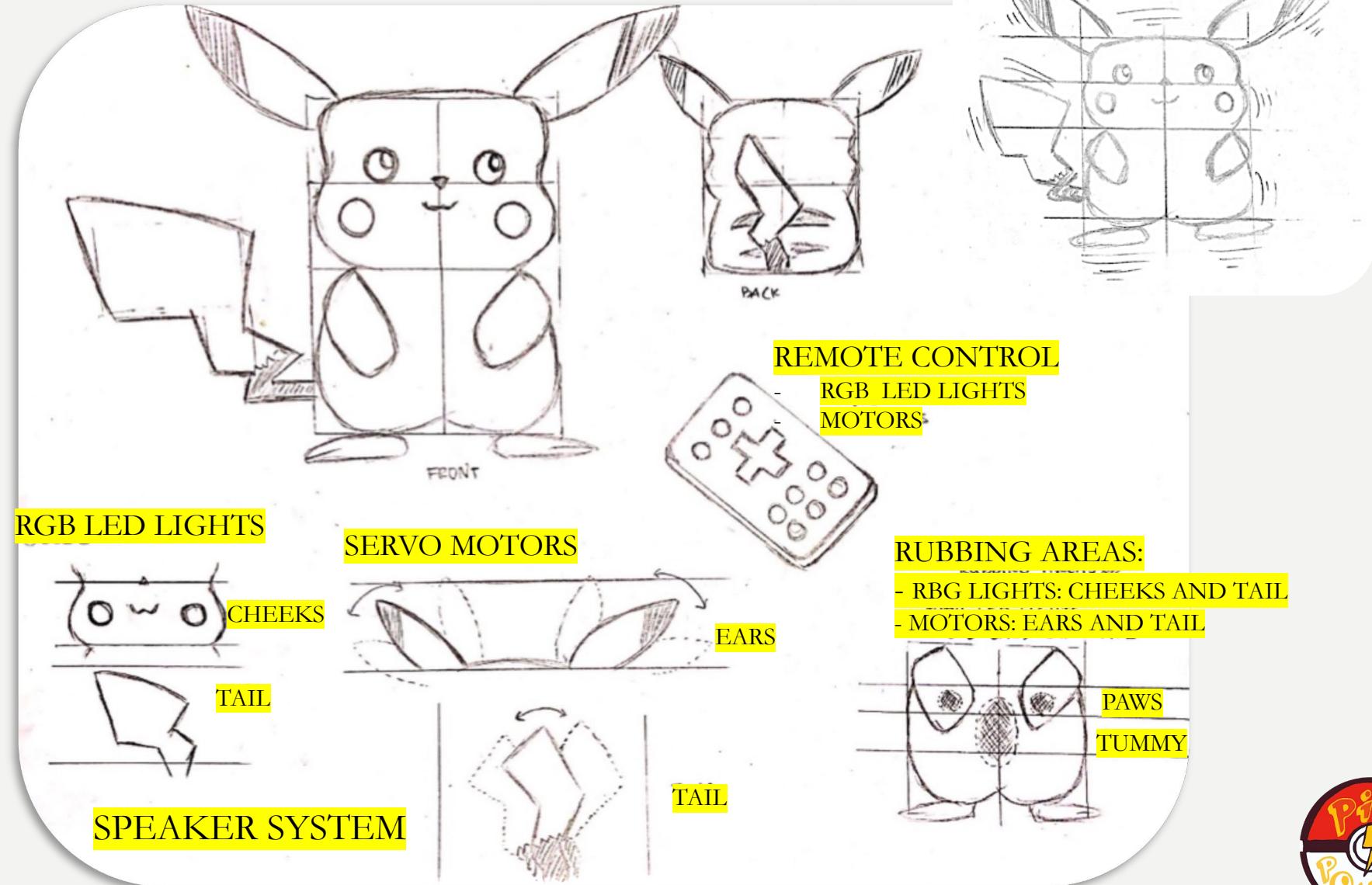


PROJECT PLANNING



Initial Product Design:

Pika Power



Changes:

THEN

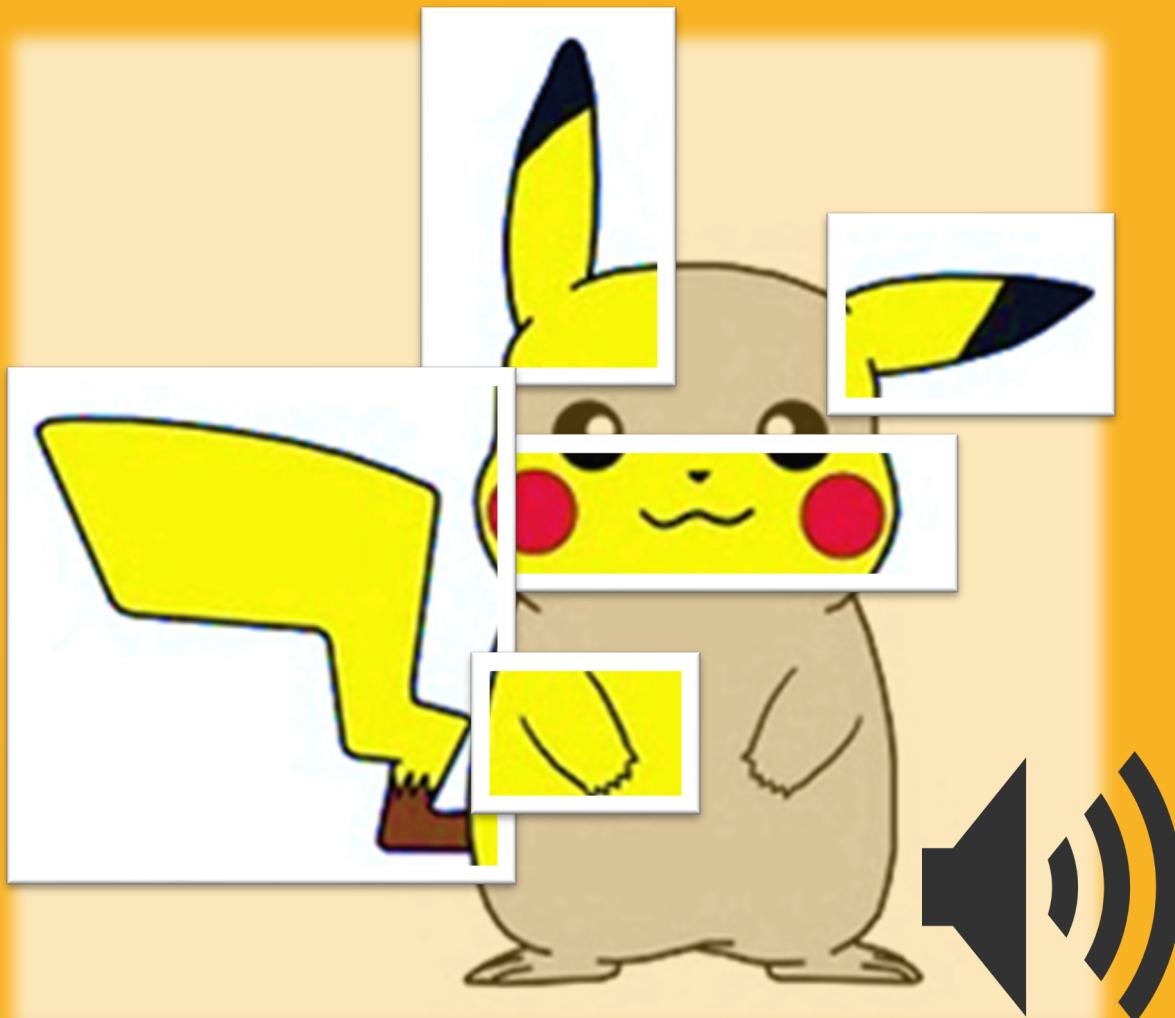
- Simple buzz sound
- Temp sensors

NOW

- Human Emotions through sounds
 - Happy
 - Angry
 - Bothered
 - Annoyed
- Push buttons



RIGHT BUTTON

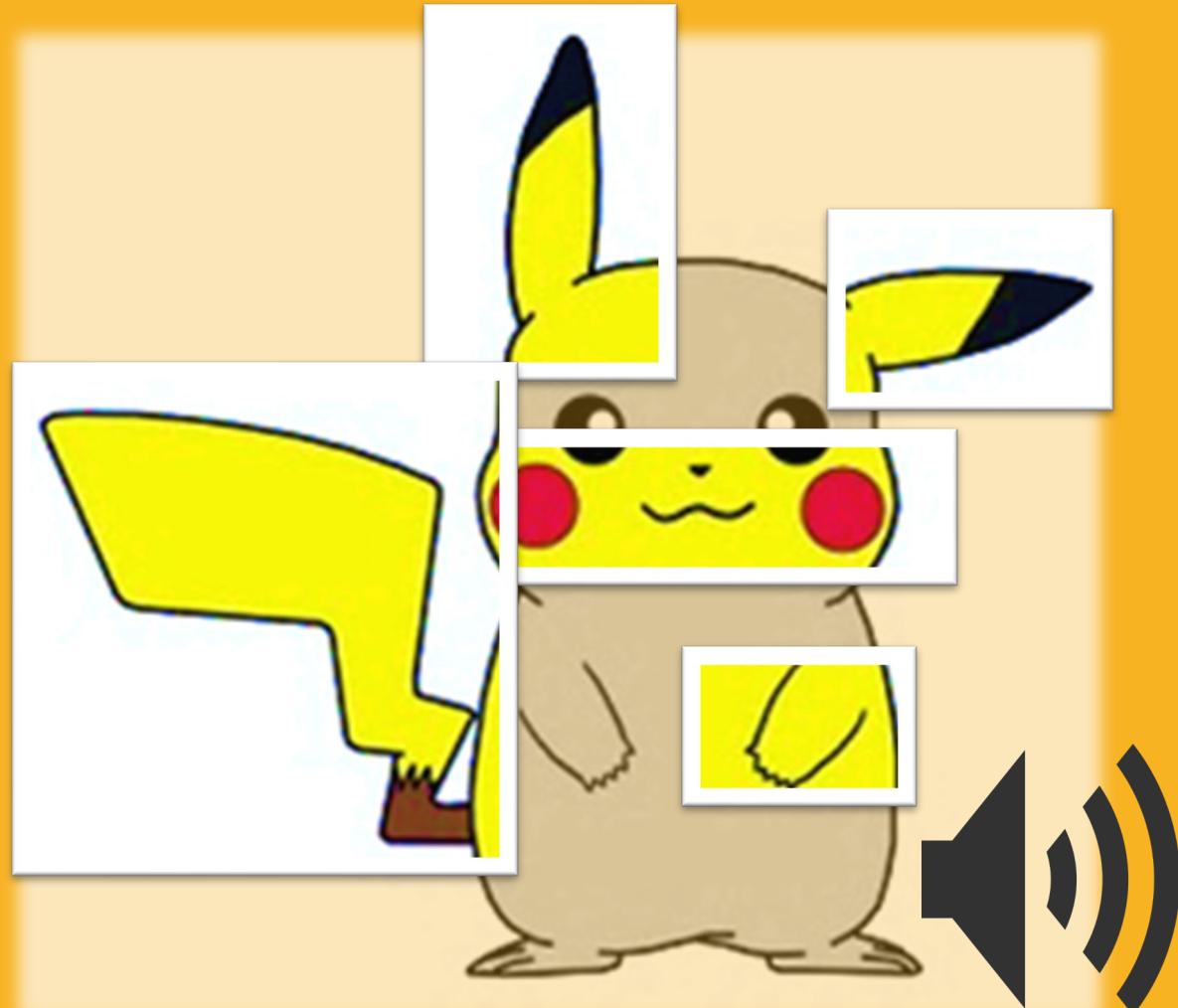


RGB LED: cheeks and tail will slowly blink yellow at the same time.

SERVO MOTOR: the ears will shake together

SPEAKER: a voice over with “pika-pika”sound

LEFT BUTTON



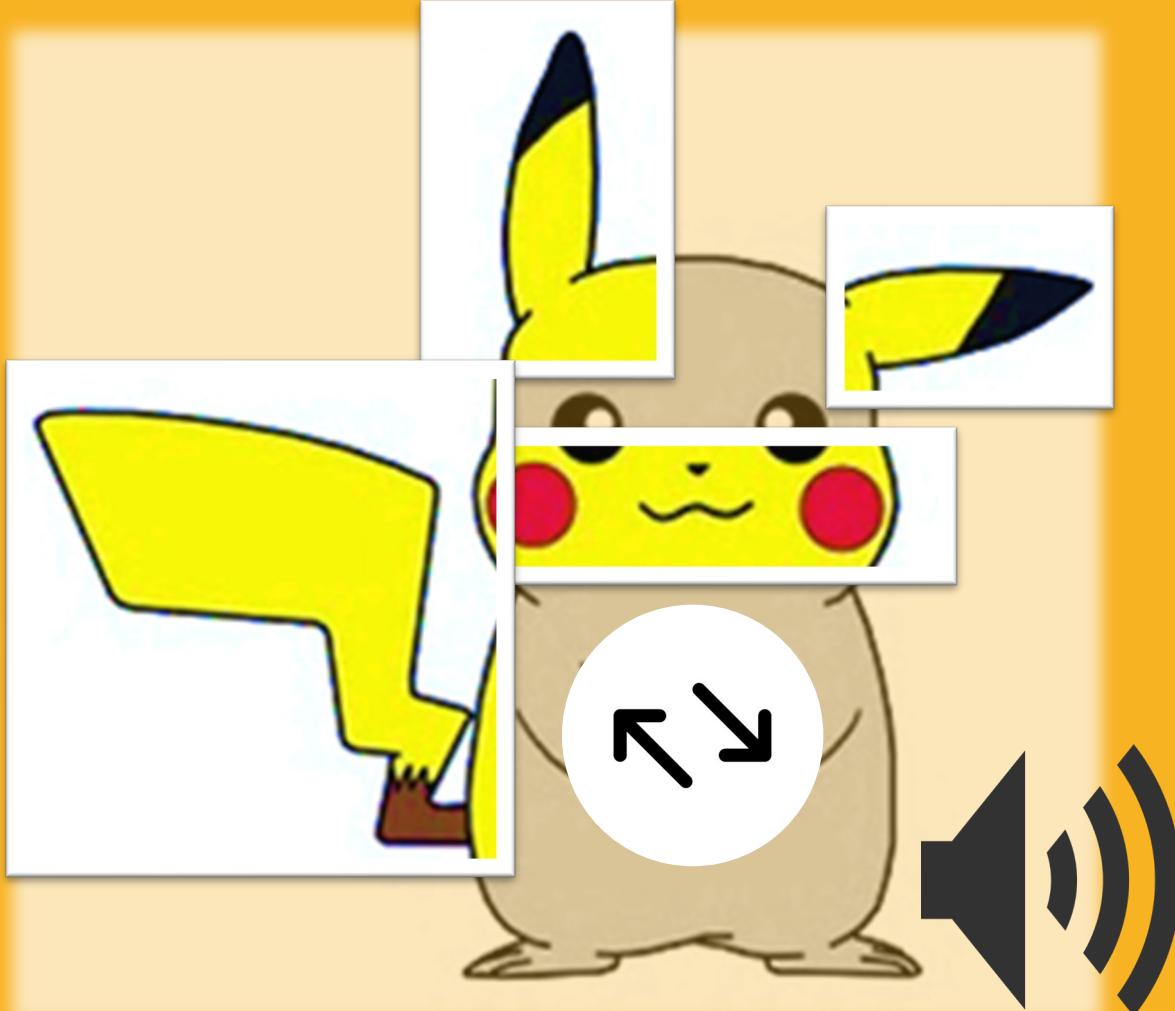
RBG: a fast red-red-yellow blink. The cheeks will blink red twice, then following a yellow blink from the tail.

SERVO MOTOR: the ears and tail will shake together in an aggressive manner.

SPEAKER: a voice over with “pika-pika-chu” sound



TIlt Sensor



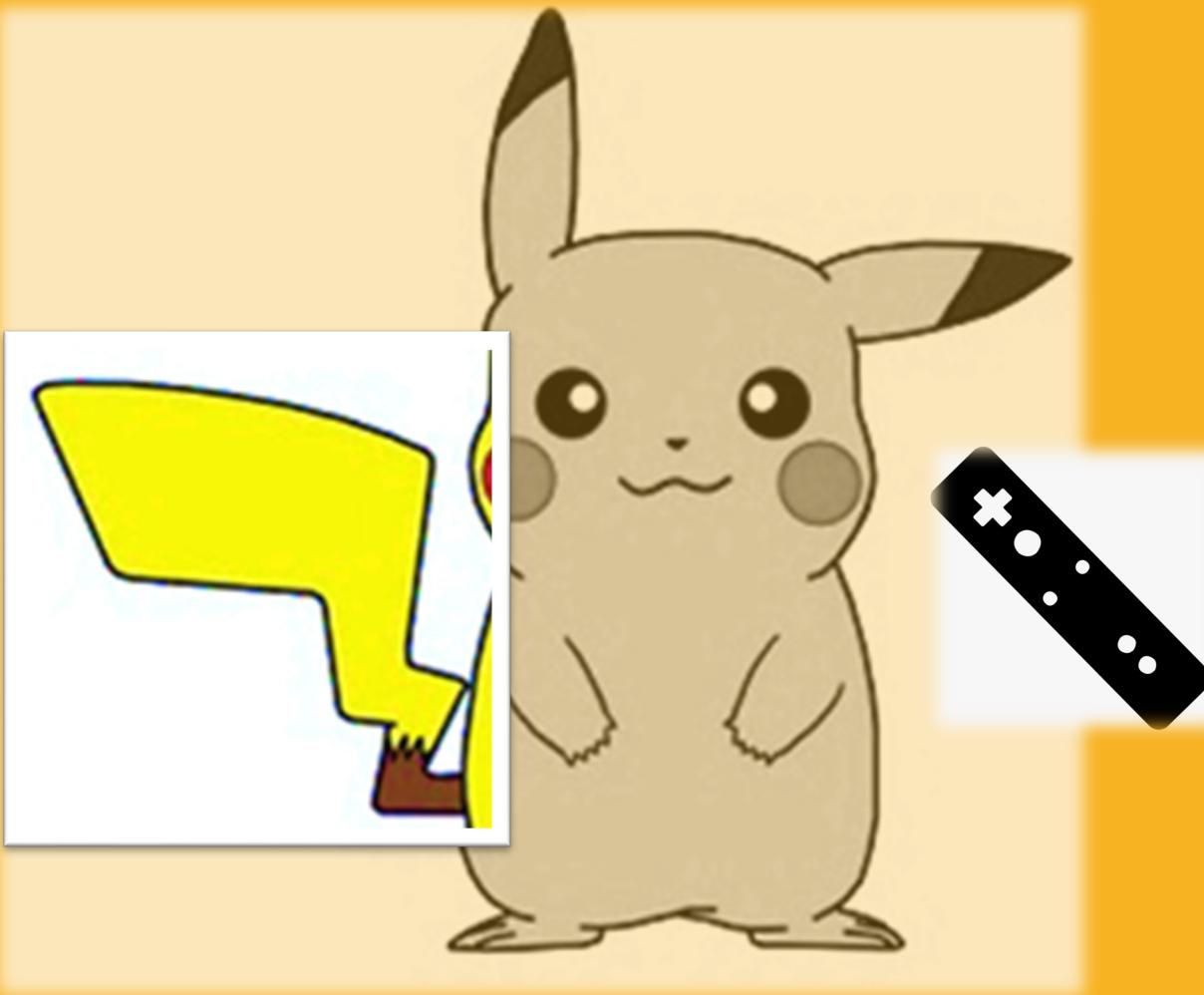
RBG: will be a fast red-red-yellow blink. The cheeks will blink red twice, then following a yellow blink from the tail.

SERVO: the ears will shake together in an aggressive manner.

SPEAKER: a voice over of a frustrated Pikachu

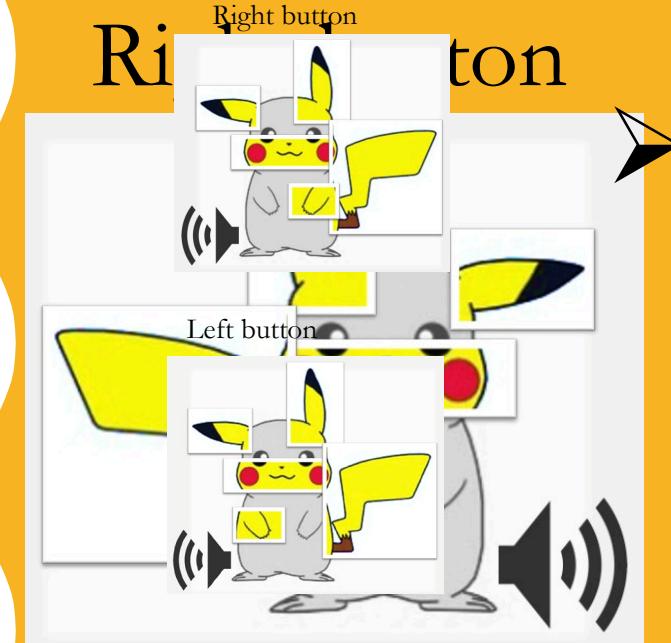


REMOTE CONTROL



RGB: lighting
pattern for the tail

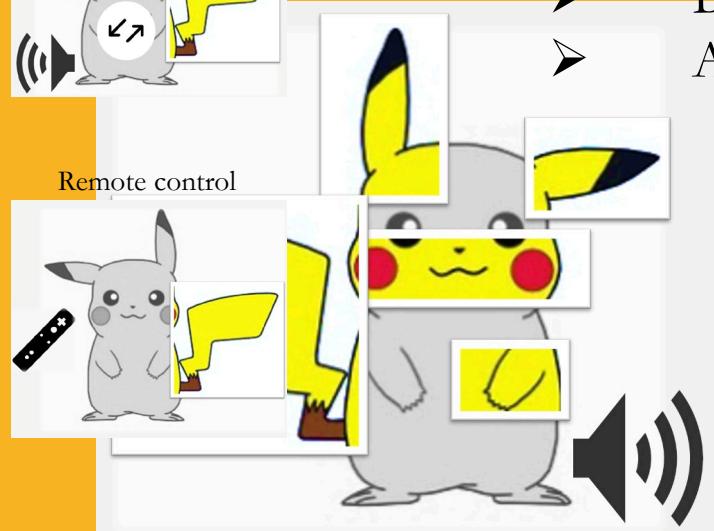




Right button



Tilt sensor

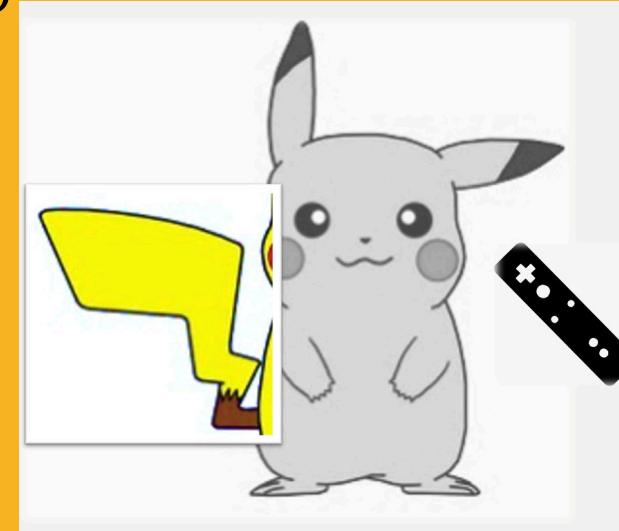


Remote control

➤ LIGHTS
Tilt sensor
MOVEMENTS
SOUND
➤ EMOTIONS

➤ Remote control

HAPPY
ANGRY
BOthered
ANNOyED





THEORY





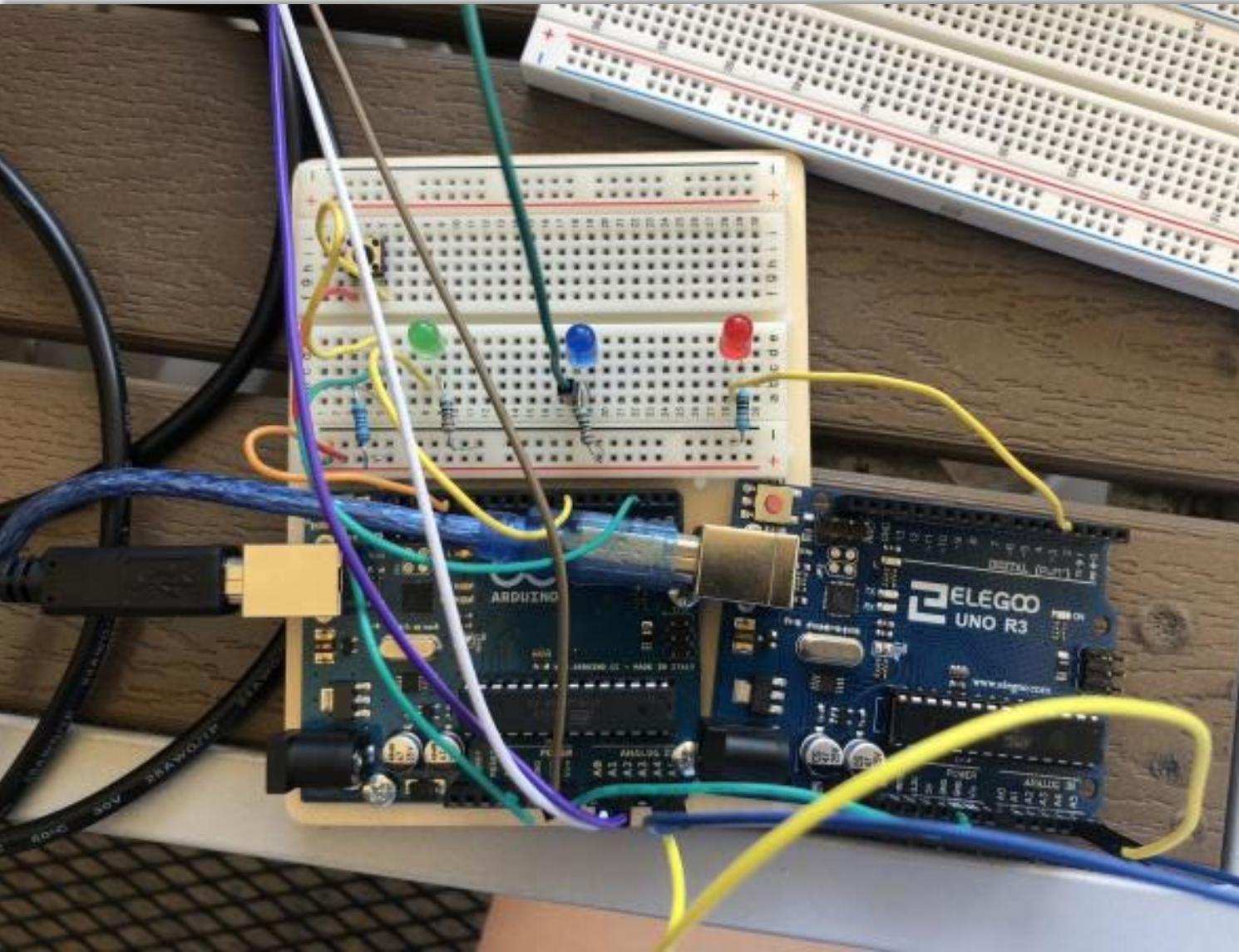
ARDUINO PIN PARTITIONING

# Pin	Arduino 1	Arduino 2
2	IR Remote	RGB Tail 3 red
3	Right Button	RGB Tail 3 green
4	Left Button	RGB Tail 3 blue
5		RGB Tail 4 red
6	RGB Tail 1 red	RGB Tail 4 green
7	RGB Tail 1 green	RGB Tail 4 blue
8	RGB Tail 1 blue	Chip Select (SD Card)
9	Servo Right Ear	Amplifier/Speaker Signal
10	Servo Left Ear	
11		Master Out Slave In (SD Card)
12		Master In Slave Out (SD Card)
13		Serial Clock (SD Card)
A0	RGB Tail 2 red	RGB Cheeks red
A1	RGB Tail 2 green	RGB Cheeks green
A2	RGB Tail 2 blue	RGB Cheeks blue
A3		Servo Tail
A4	----- Arduino Connection -----	
A5	----- Arduino Connection -----	





SIMPLE CONNECTION BETWEEN 2 ARDUINOS



ARDUINO MASTER VS SLAVE CODE

Arduino_Master

```
#include <Wire.h> //transmit between two Arduinos, this Arduino is the master
#include <IRremote.h> //enables library for IR Remote input
#include <Servo.h> //enables Servo library

#define RECV_PIN 2 // digital pin for IR Remote input
#define r_button 3 // right button on doll
#define l_button 4 // left button on doll
#define TILT_belly 5 //tilt sensor in belly of doll
#define taill_RED 6 //multi-color display in tail, red
#define taill_GREEN 7 //multi-color display in tail, green
#define taill_BLUE 8 //multi-color display in tail, blue
Servo servo_lt_ear; //sets up servo motor in left ear of doll
Servo servo_rt_ear; //sets up servo motor in right ear of doll
#define tail2_RED 14 //variations of yellow in tail, red
#define tail2_GREEN 15 //variations of yellow in tail, green
#define tail2_BLUE 16 //variations of yellow in tail, blue
IRrecv irrecv(RECV_PIN); // enables the IR Remote input pin #
decode_results results; // decodes results from IR Remote selection

//these variables customize minibehaviors and timing within the doll
int pika_setup = 21;
int cheek_redblink = 22;
int angry_red = 23;
int angry_thunderl = 24;
int angry_thunder2 = 25;
int dizzy_pika = 26;
int dizzy_shockl = 27;
int dizzy_shock2 = 28;

void setup(){
    Wire.begin(17); //initiates the Wire library, joins I2C bus as a master or slave
    Serial.begin(9600); //begins Serial monitor
    irrecv.enableIRIn();
    pinMode(r_button,INPUT);
    pinMode(l_button,INPUT);
    pinMode(TILT_belly,INPUT);
    servo_rt_ear.attach(9); // servo motor right ear on doll
    servo_lt_ear.attach(10); // servo motor left ear on doll
    //servo_rt_ear.write(0); //establishes 0 for right ear
    //servo_lt_ear.write(0); //establishes 0 for left ear
    pinMode(taill_RED,OUTPUT);
    pinMode(taill_GREEN,OUTPUT);
    pinMode(taill_BLUE,OUTPUT);
    pinMode(tail2_RED,OUTPUT);
    pinMode(tail2_GREEN,OUTPUT);
    pinMode(tail2_BLUE,OUTPUT);
```

Arduino_Slave

```
#include <Wire.h> //transmit between two Arduinos, this Arduino is the slave
#include <Servo.h> //enables Servo library
#include "SD.h" //library to read SD card
#include "TMRpcm.h" //library to play audio
#include "SPI.h" //SPI library for SD card
#define tail3_RED 2 //tail RGB #3 red
#define tail3_GREEN 3 //tail RGB #3 green
#define tail3_BLUE 4 //tail RGB #4 blue
Servo servo_tail; //sets up servo motor in tail3
#define tail4_RED 5 //tail RGB #4 red
#define tail4_GREEN 6 //tail RGB #4 green
#define tail4_BLUE 7 //tail RGB #4 blue
#define SD_ChipSelectPin 8 //Chip select is pin number 4
#define cheeks_RED 14 //cheek RGB red
#define cheeks_GREEN 15 //cheek RGB green
#define cheeks_BLUE 16 //check RGB blue
int x = 0;
TMRpcm music; //Library object is named "music"

void setup() {
    Wire.begin(17);
    pinMode(tail3_RED,OUTPUT);
    pinMode(tail3_GREEN,OUTPUT);
    pinMode(tail3_BLUE,OUTPUT);
    servo_tail.attach(A3);
    pinMode(tail4_RED,OUTPUT);
    pinMode(tail4_GREEN,OUTPUT);
    pinMode(tail4_BLUE,OUTPUT);
    pinMode(cheeks_RED,OUTPUT);
    pinMode(cheeks_GREEN,OUTPUT);
    pinMode(cheeks_BLUE,OUTPUT);
    Serial.begin(9600);
    music.speakerPin = 9; //arduino out on pin 9
    if (!SD.begin(SD_ChipSelectPin)) { //failsafe for SD card check
        Serial.println("SD fail");
        return;
    }
    music.setVolume(5); //0 to 5. Sets volume level
    music.quality(1);
}
```





Arduino_Master

```
void pikaInput() {  
    if(digitalRead(r_button) == HIGH) { //happy Pikachu behavior  
        happy_Pika();  
    }  
    else if(digitalRead(l_button) == HIGH) { //angry Pikachu behavior  
        angry_Pika();  
    }  
    else if(irrecv.decode(&results)) {  
        int value = results.value;  
        Serial.println(value);  
        switch(value) { //redo of Pikachu stretch/set up behavior  
            case 12495: //button 1  
                pikastretch();  
                break;  
            }  
            switch(value) { //happy Pikachu behavior  
                case 6375: //button 2  
                    happy_Pika();  
                    break;  
            }  
            switch(value) { //annoyed Pikachu behavior  
                case 31365: //button 3  
                    annoyed_Pika();  
                    break;  
            }  
            switch(value) { //angry Pikachu behavior  
                case 25979: //button 4  
                    angry_Pika();  
                    break;  
            }  
            switch(value) {  
                //case FF38C7: //button 5  
                //LED DESIGN  
                break;  
            }  
            switch(value) {  
                //case FF5AA5: //button 6  
                //LED DESIGN  
                break;  
            }  
            irrecv.resume();  
        }  
        else if(digitalRead(TILT_belly)==HIGH) {  
            annoyed_Pika();  
        }  
        else {  
            Serial.print("nah fam");  
        }  
    }
```

INPUT CODE



AMPLIFIER AND SOUND CODE

```
#include "SD.h" //library to read SD card
#include "TMRpcm.h" //library to play audio
#include "SPI.h" //SPI library for SD card
TMRpcm music; //Library object is named "music"
```

```
music.speakerPin = 9; //arduino out on pin 9
if (!SD.begin(SD_ChipSelectPin)) { //failsafe for SD card check
    Serial.println("SD fail");
    return;
}
music.setVolume(5); //0 to 5. Sets volume level
music.quality(1);
music.play("PIWAV4.wav", 0);
delay(1020);
```

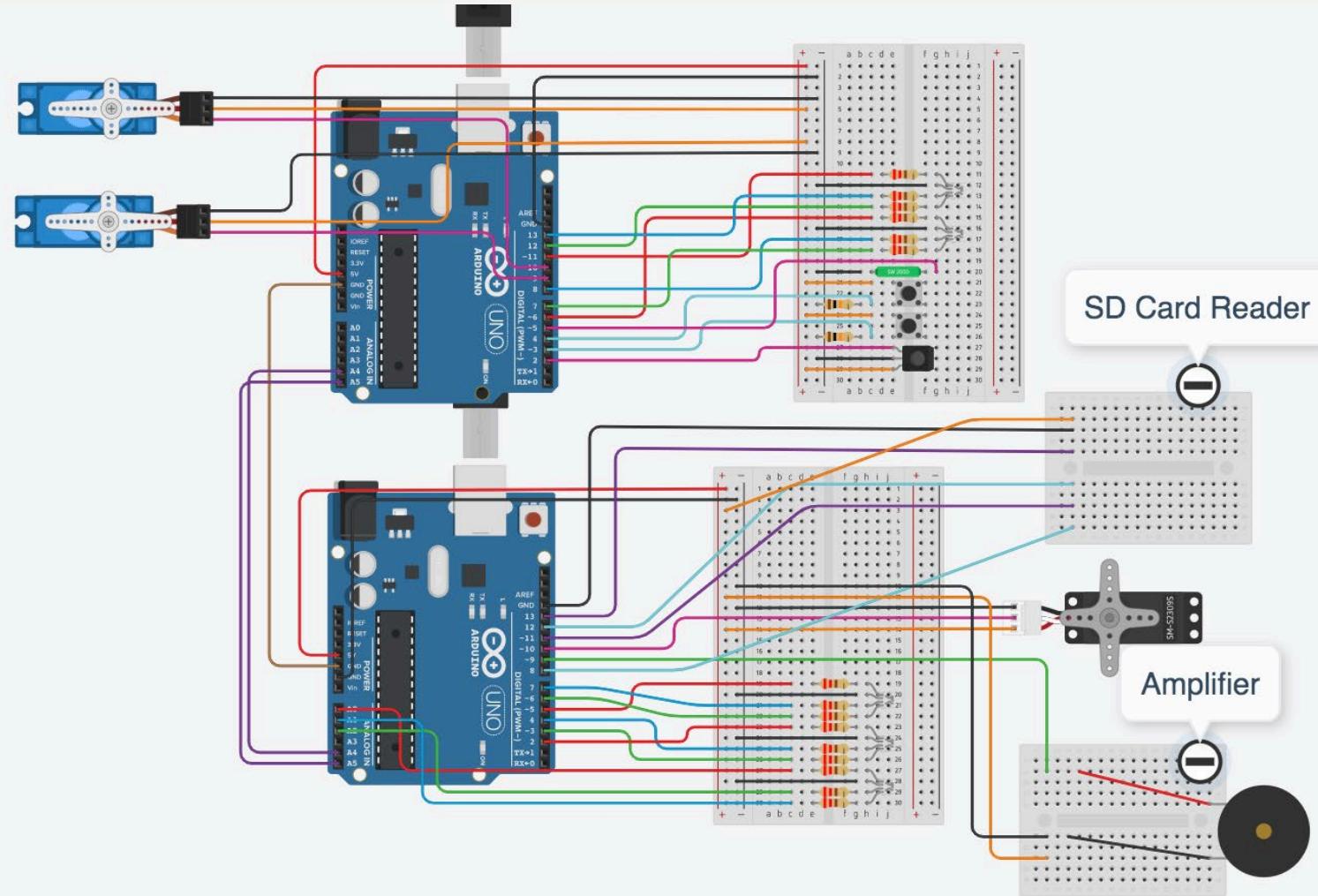




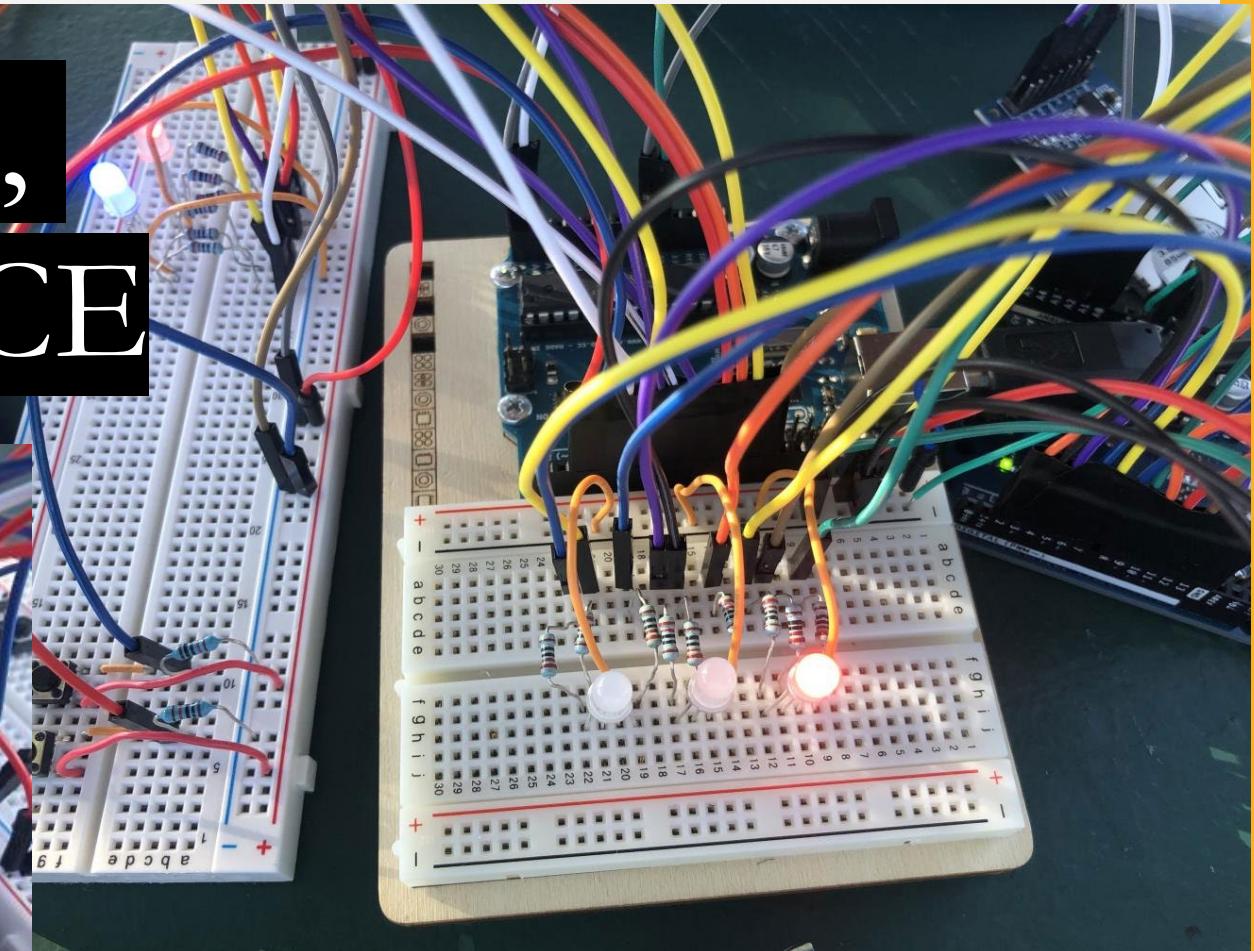
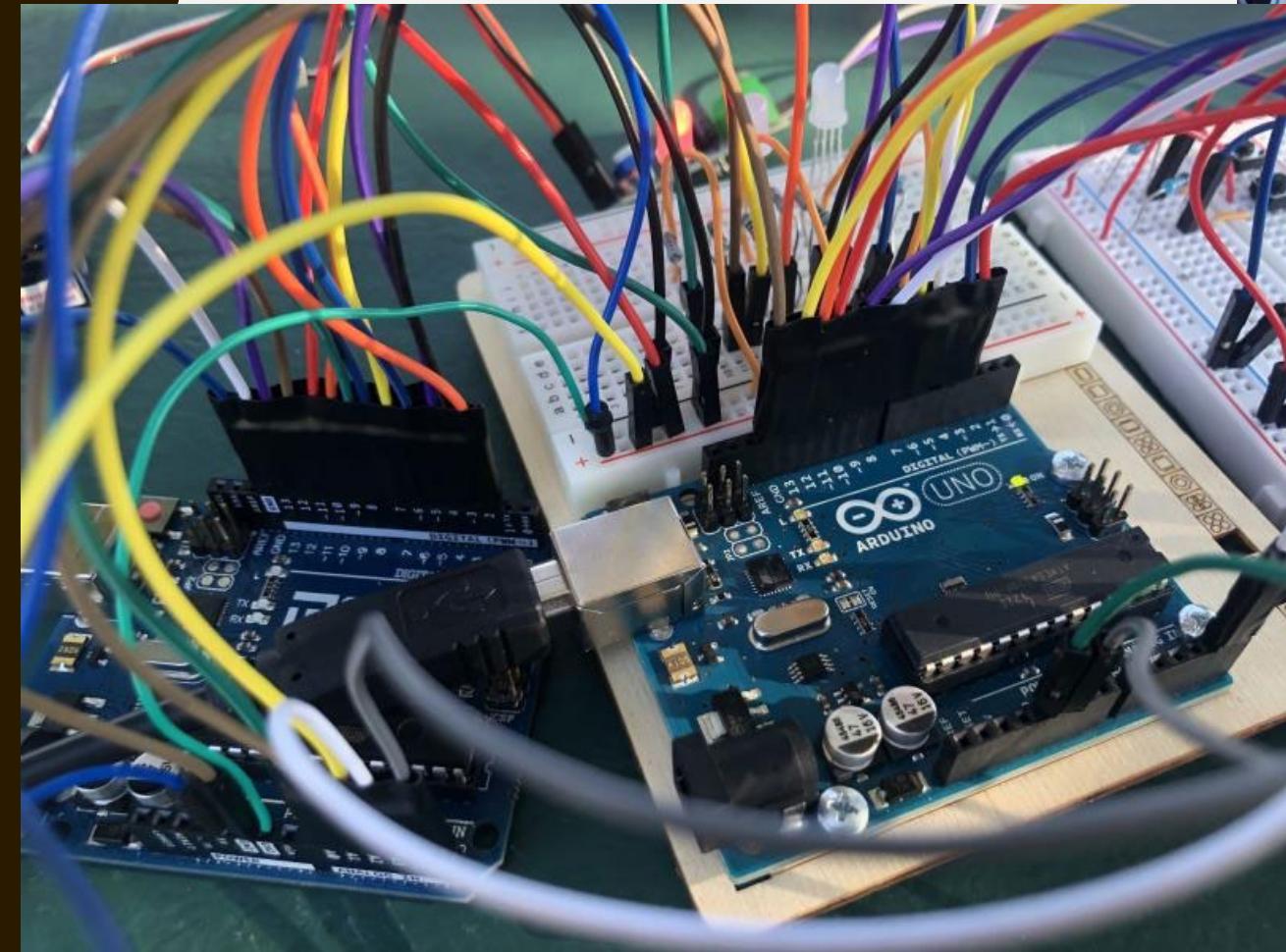
BUILDING PROCESS

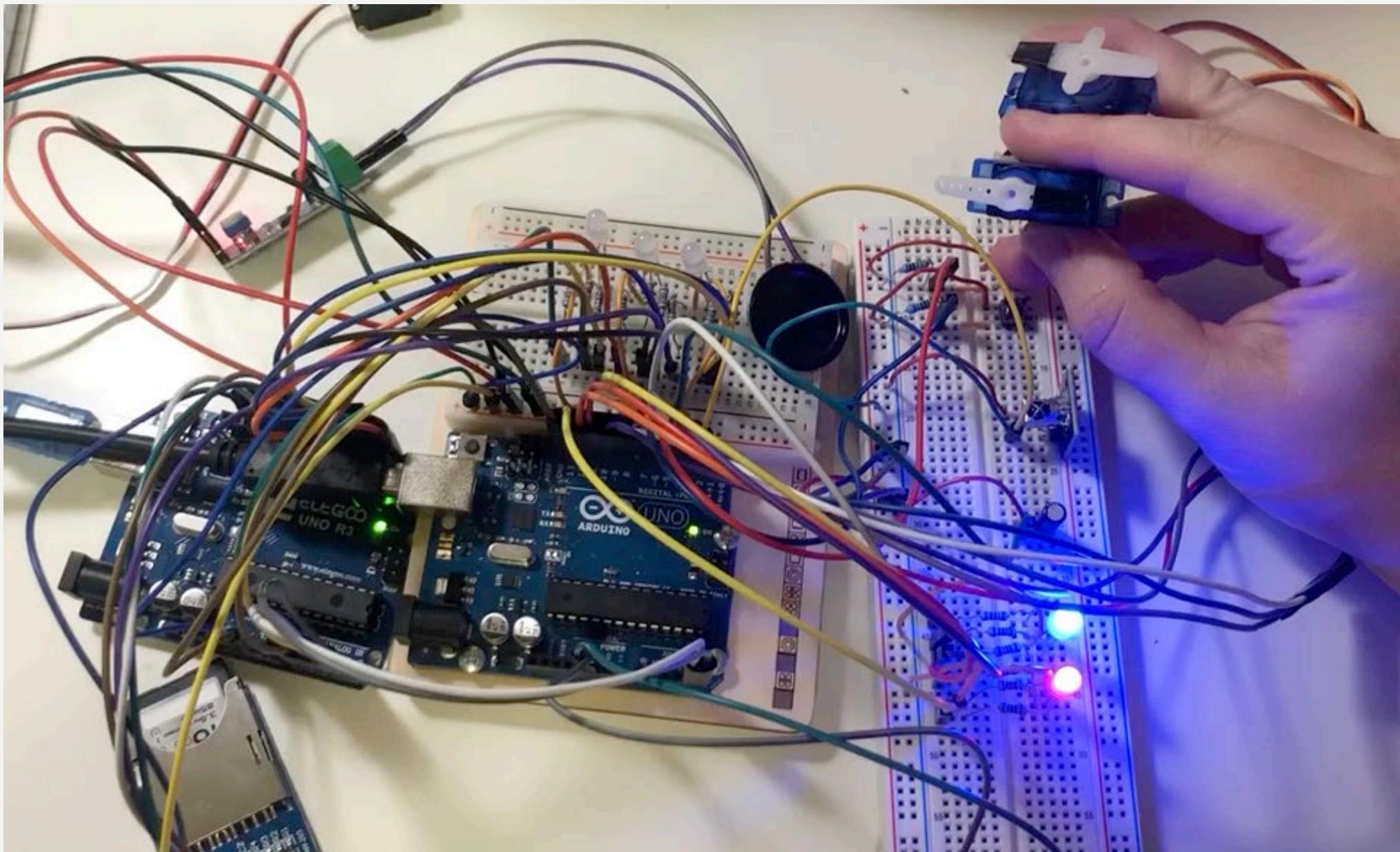


Overview

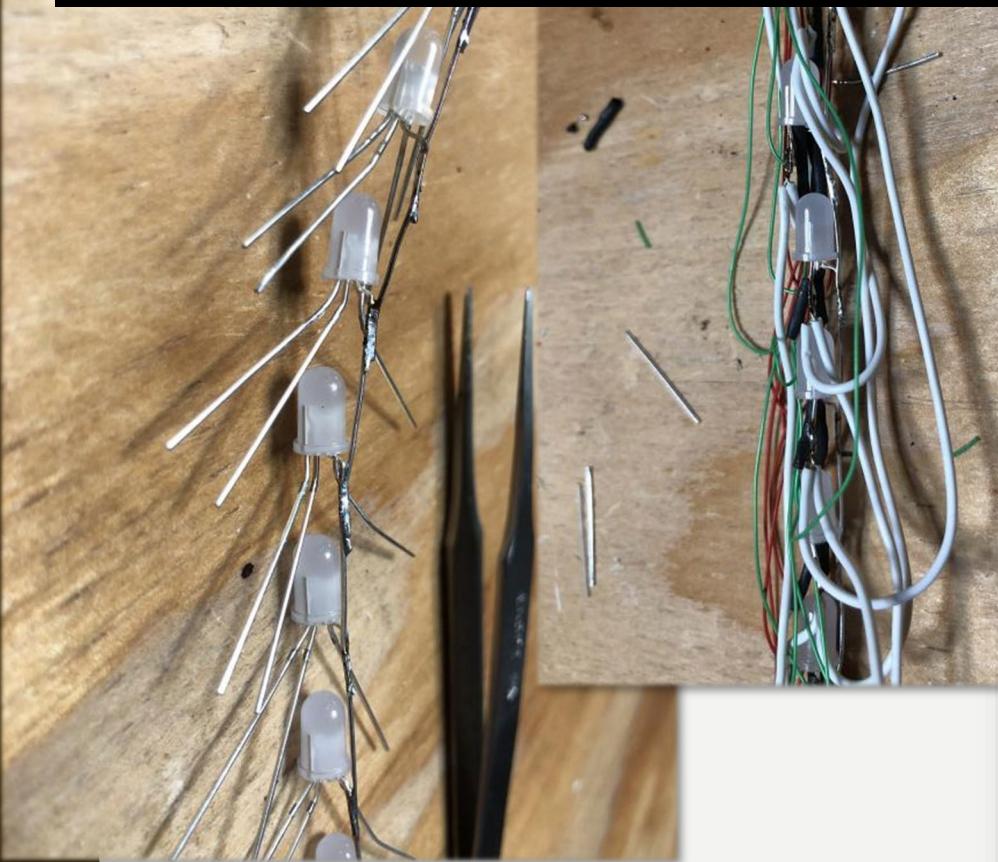


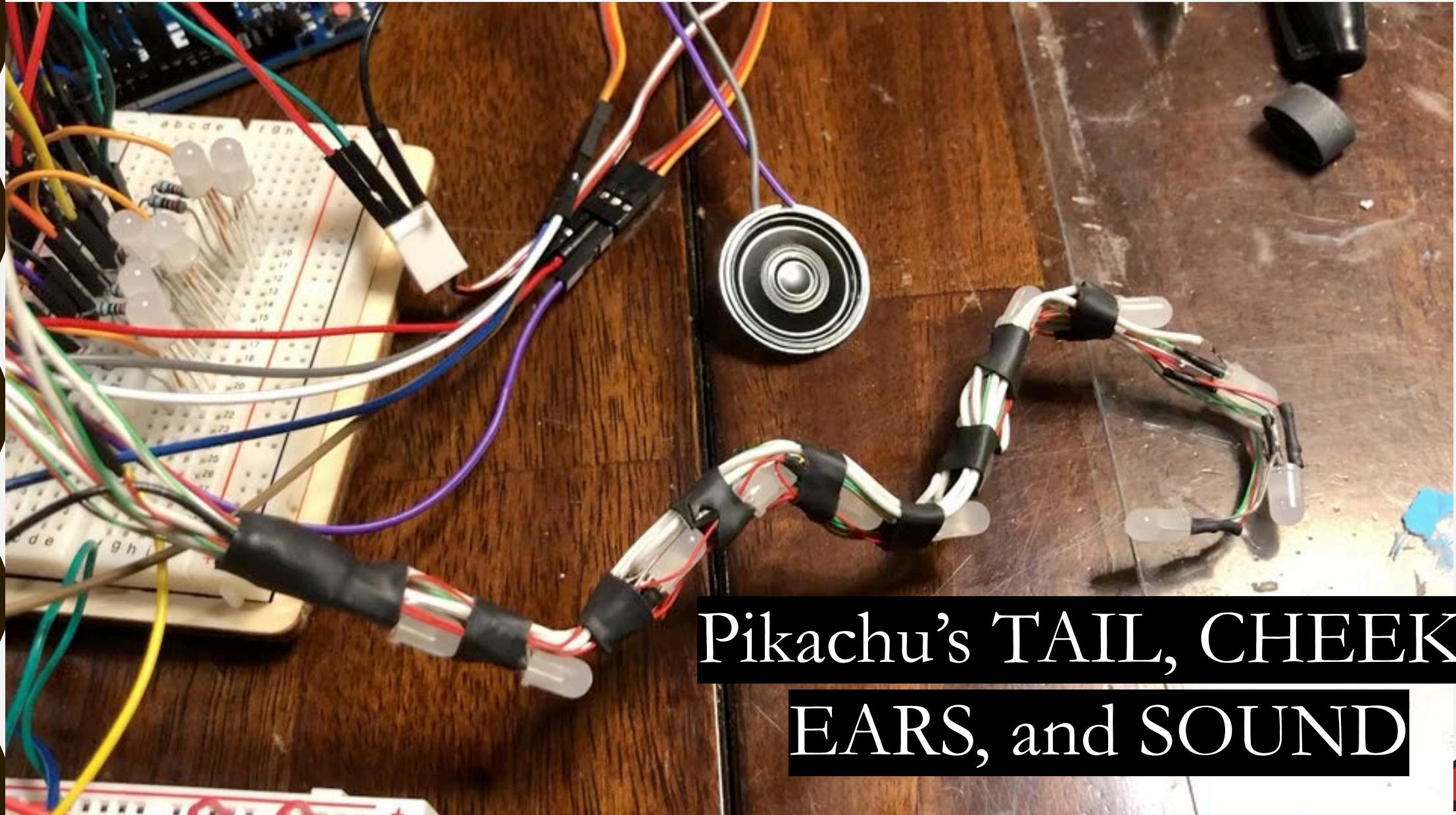
Pikachu's CHEEKS, EARS, TAIL, & VOICE





Pikachu's TAIL

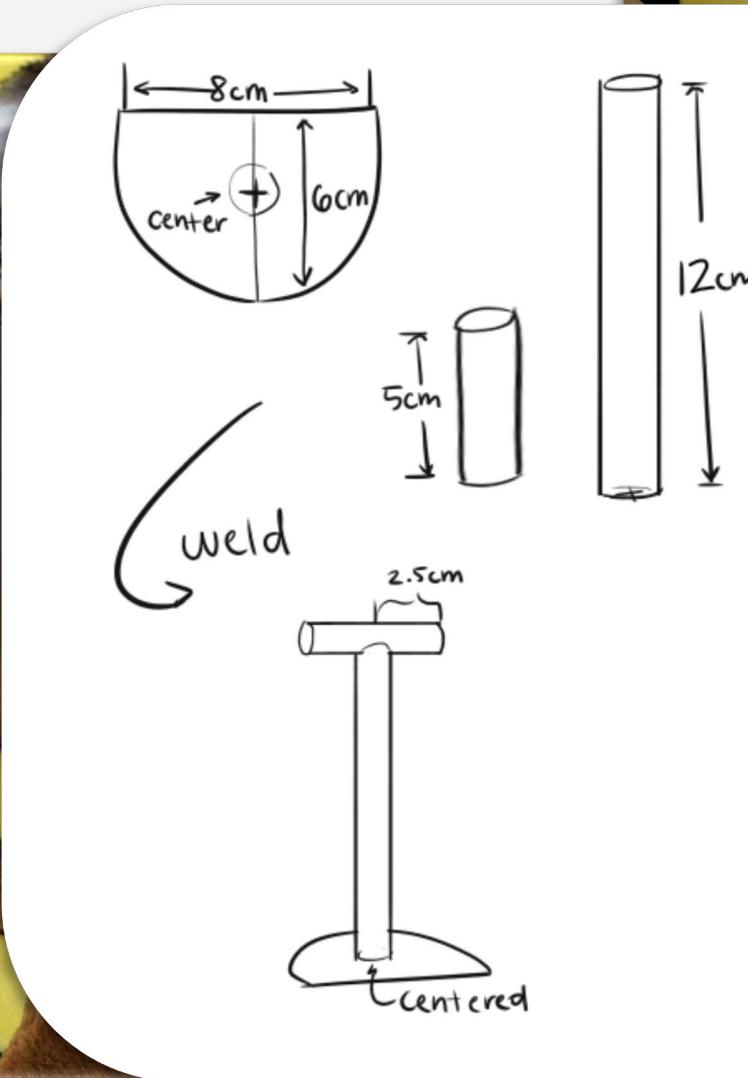




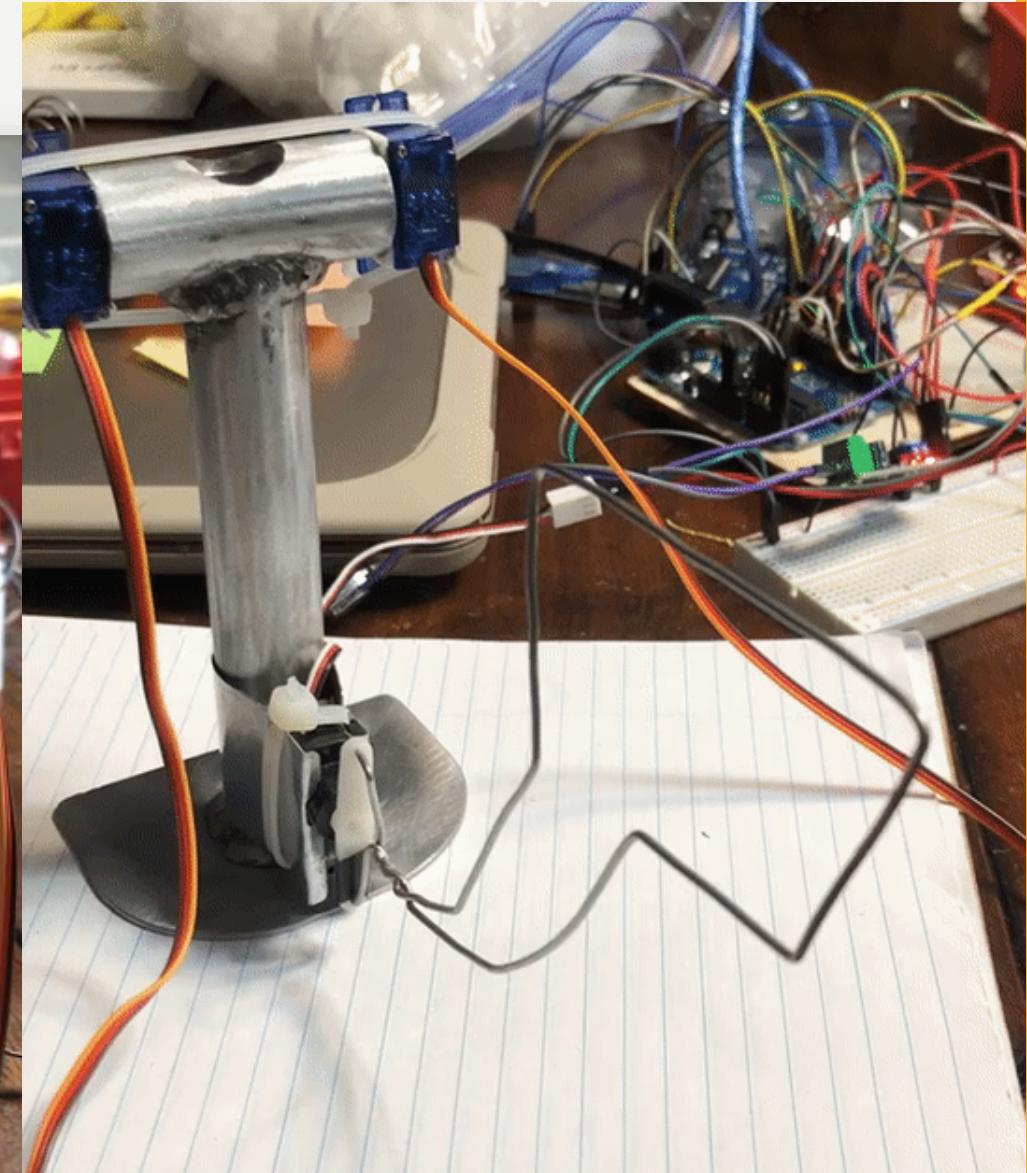
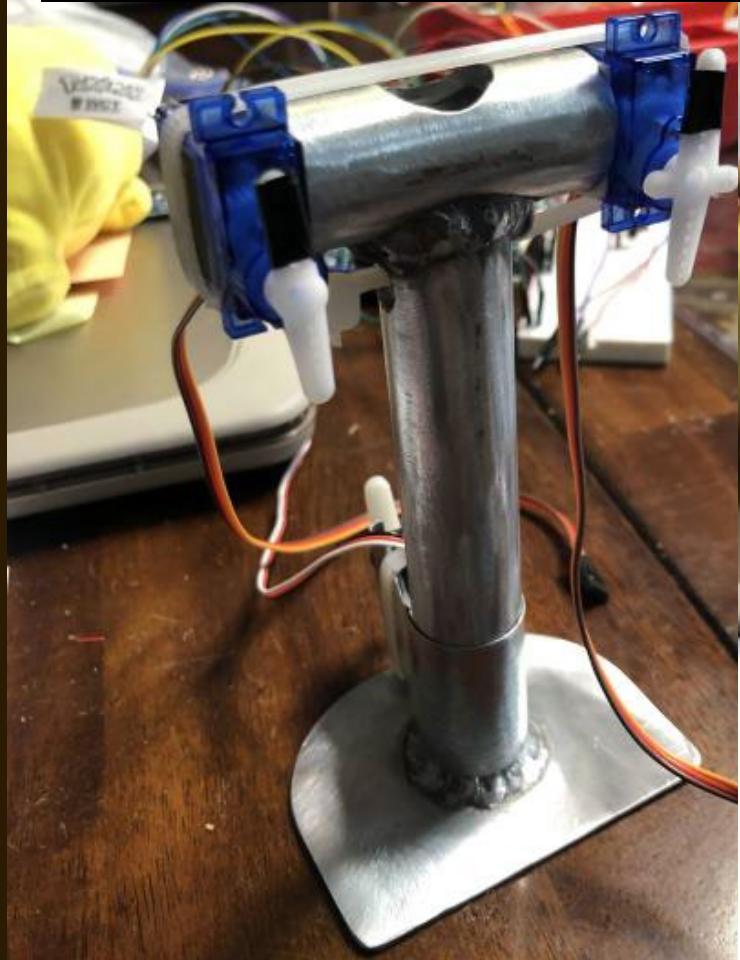
Pikachu's TAIL, CHEEKS
EARS, and SOUND



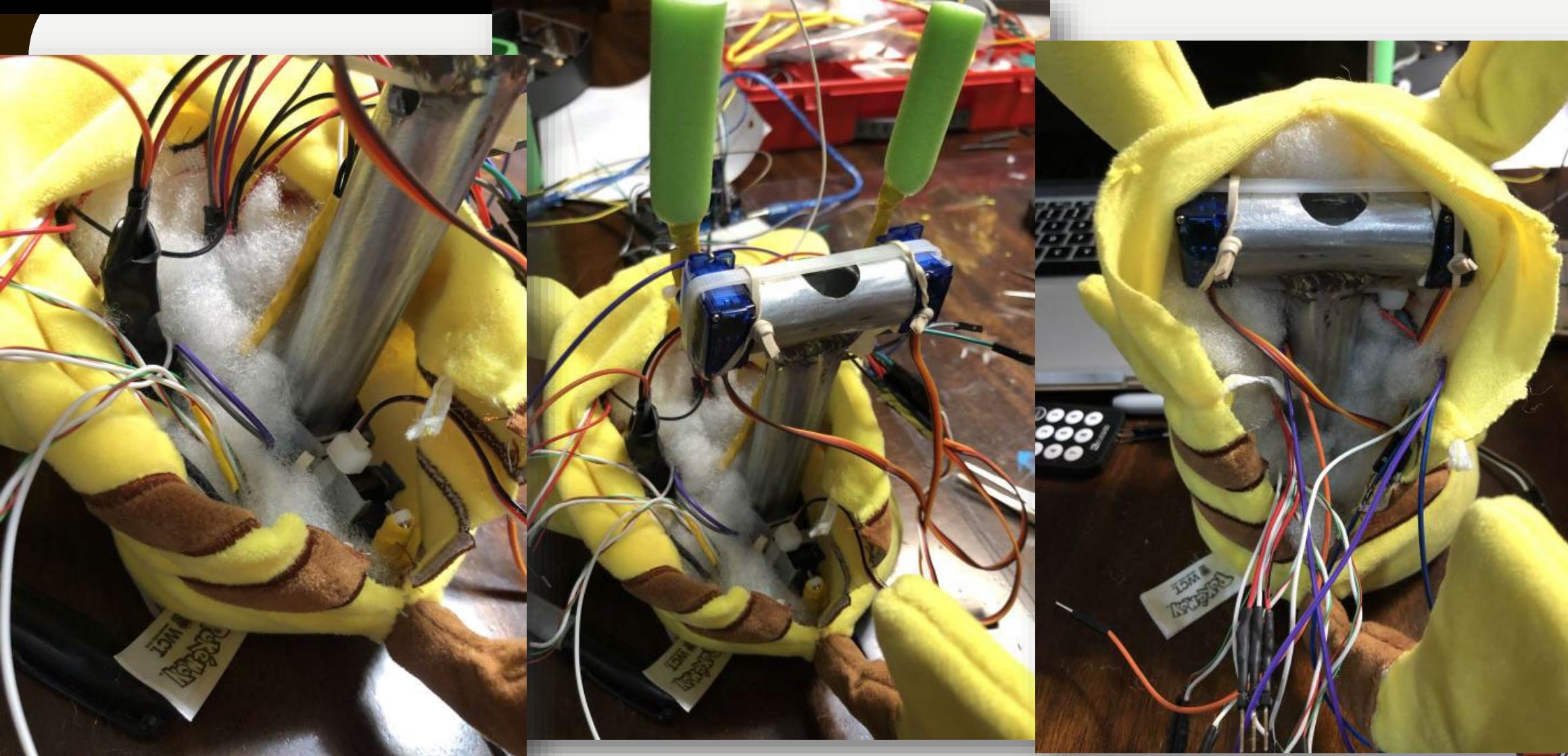
PIKACHU'S METAL STRUCTURE



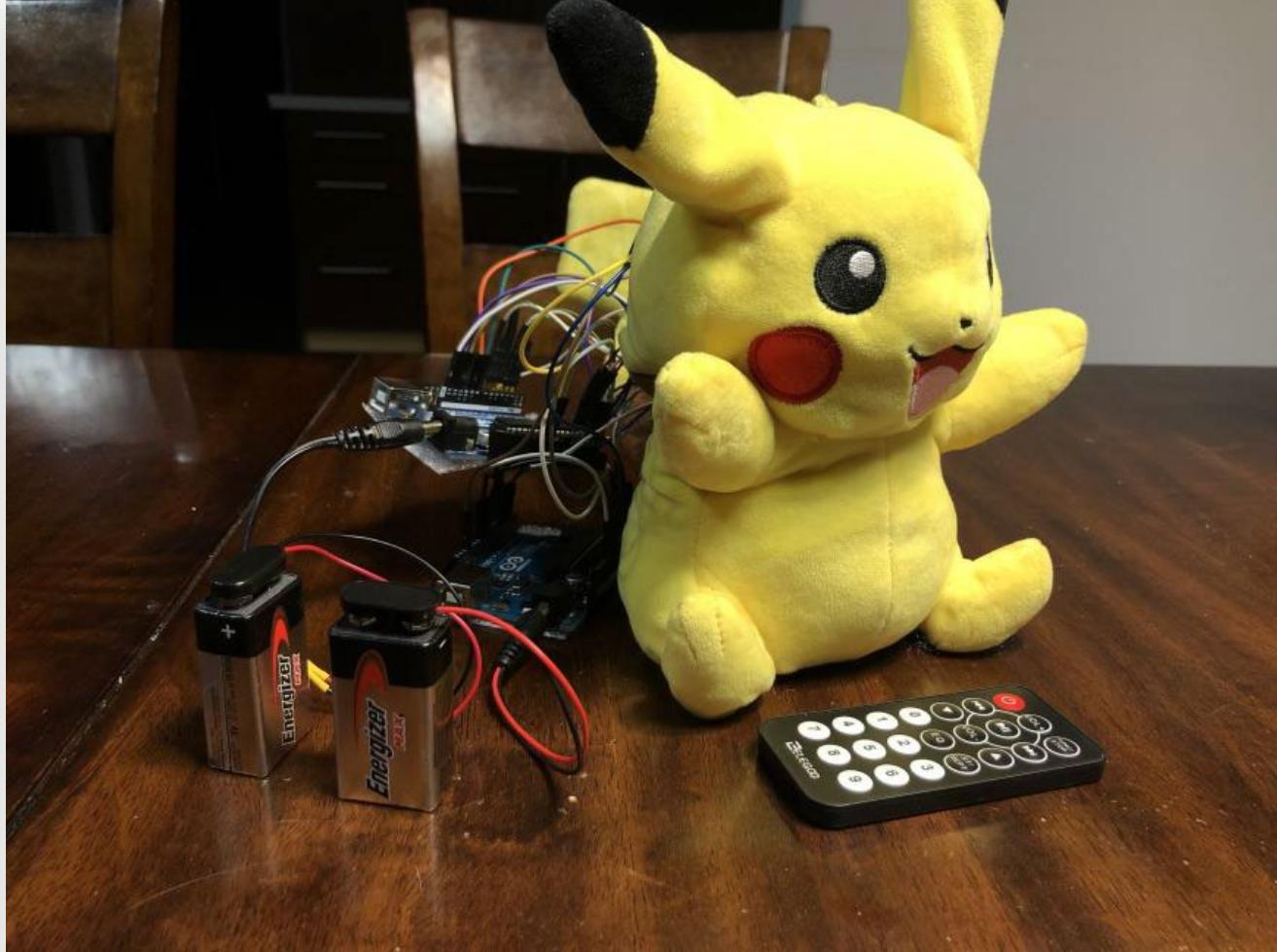
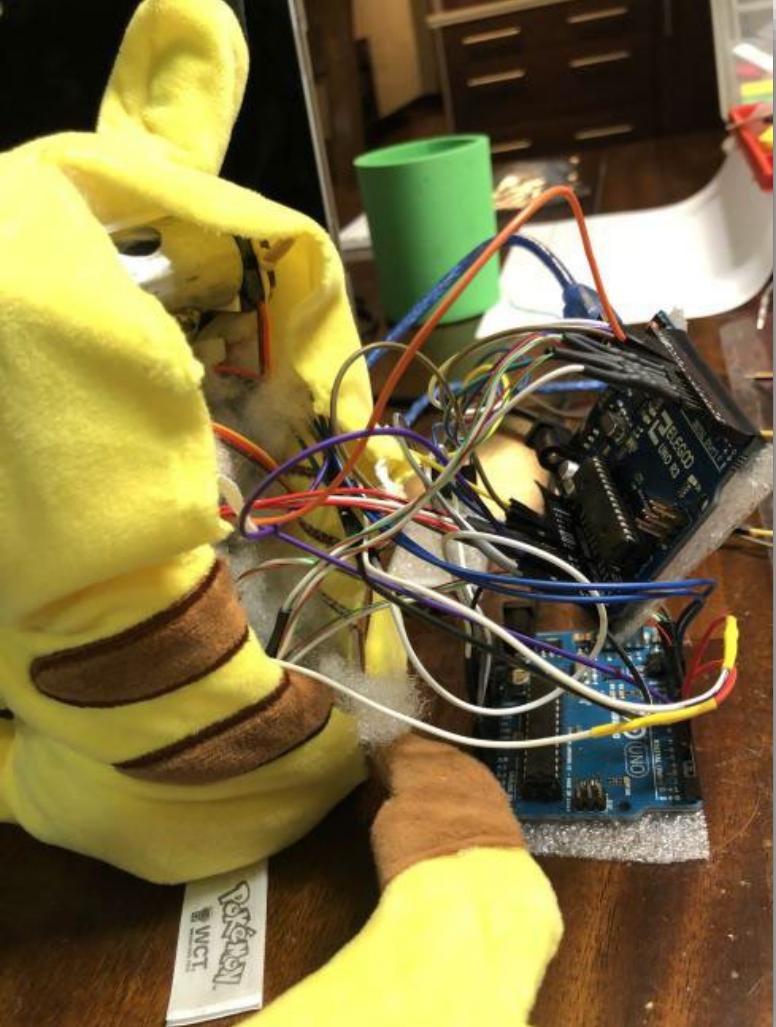
Pikachu's MOTORS



Construction



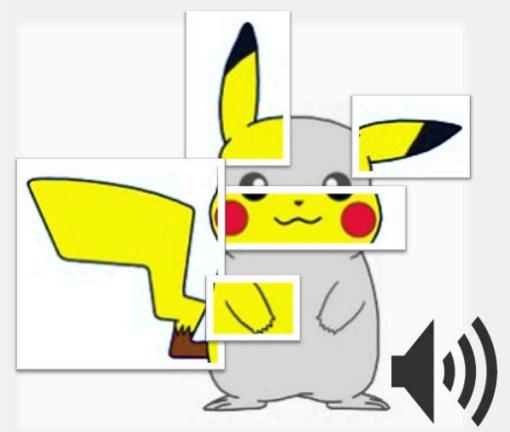
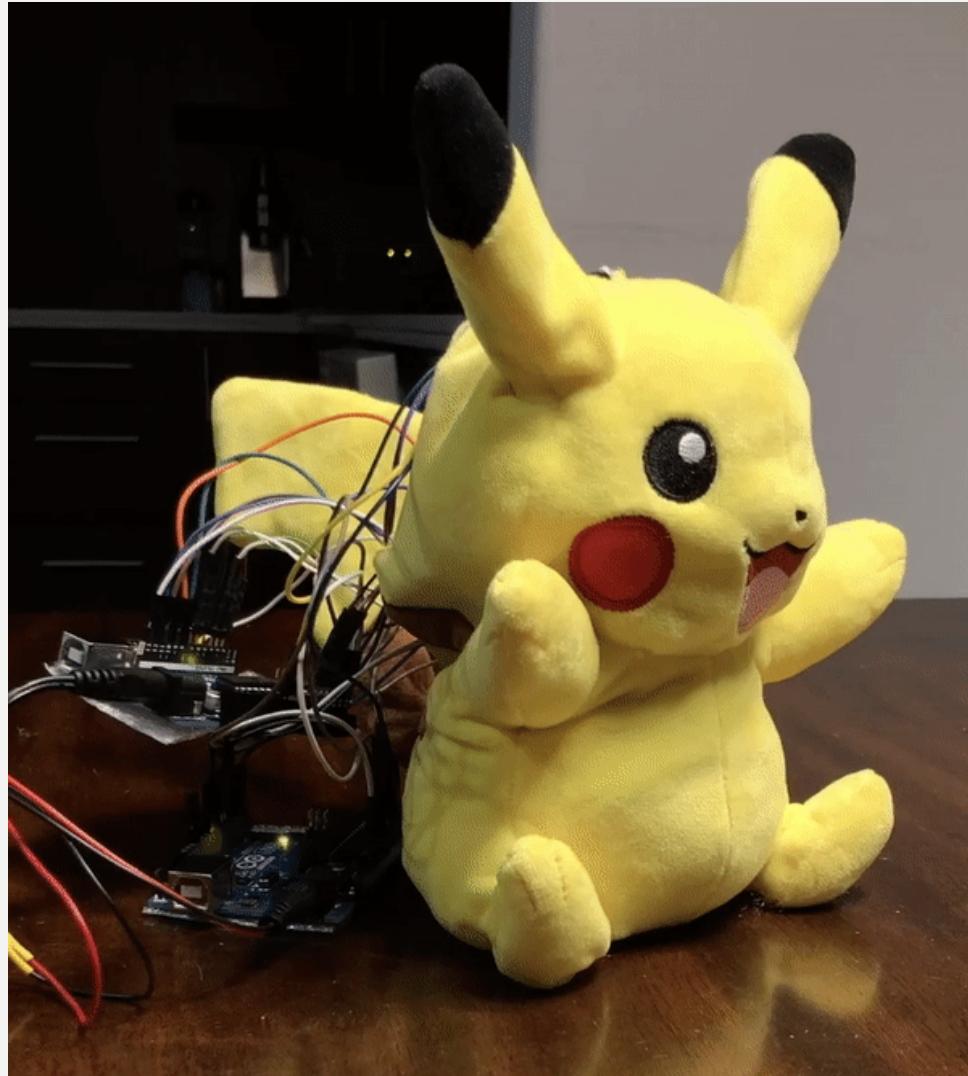
Final Build





RESULTS

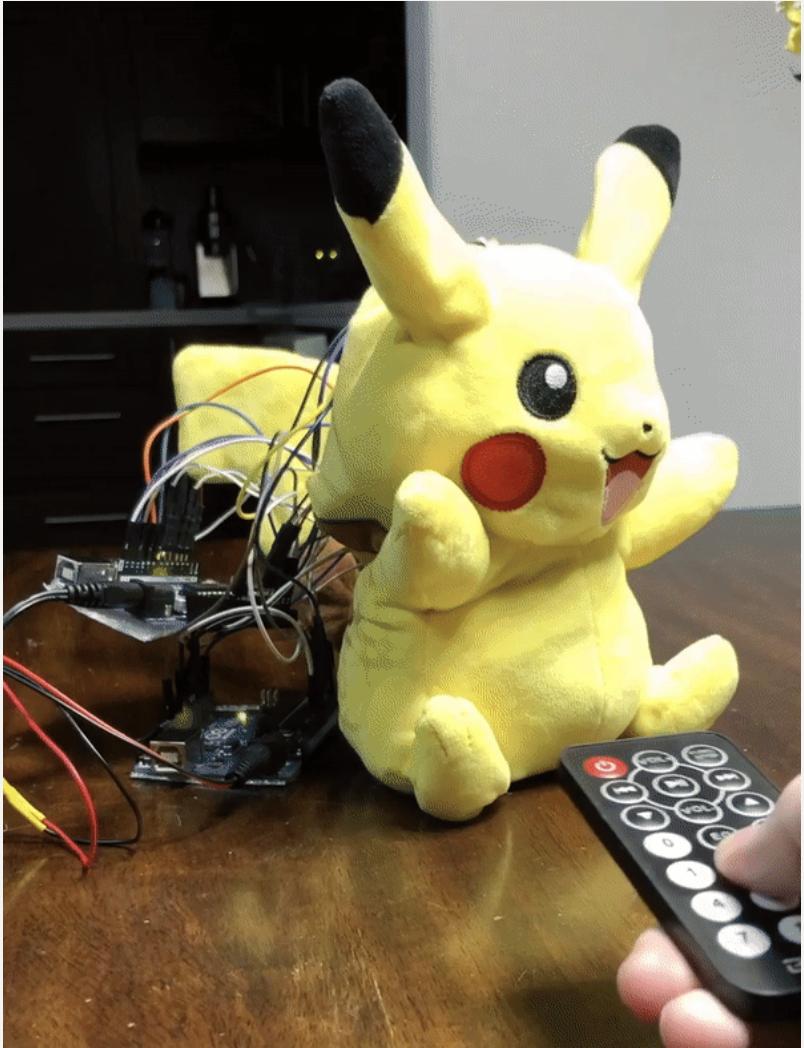




Pikachu Start up Reaction

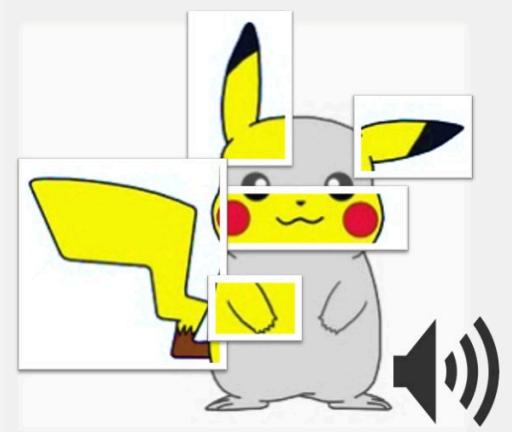
Initiated upon start and Remote Control Button 1

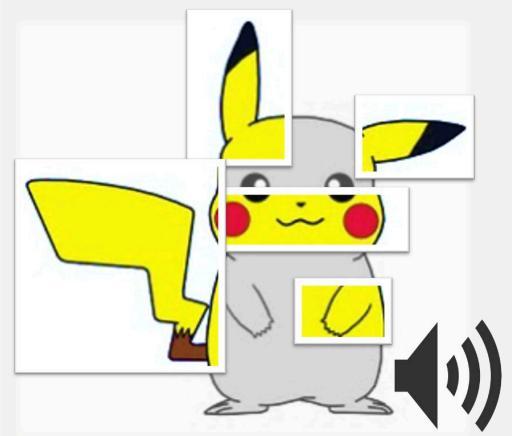
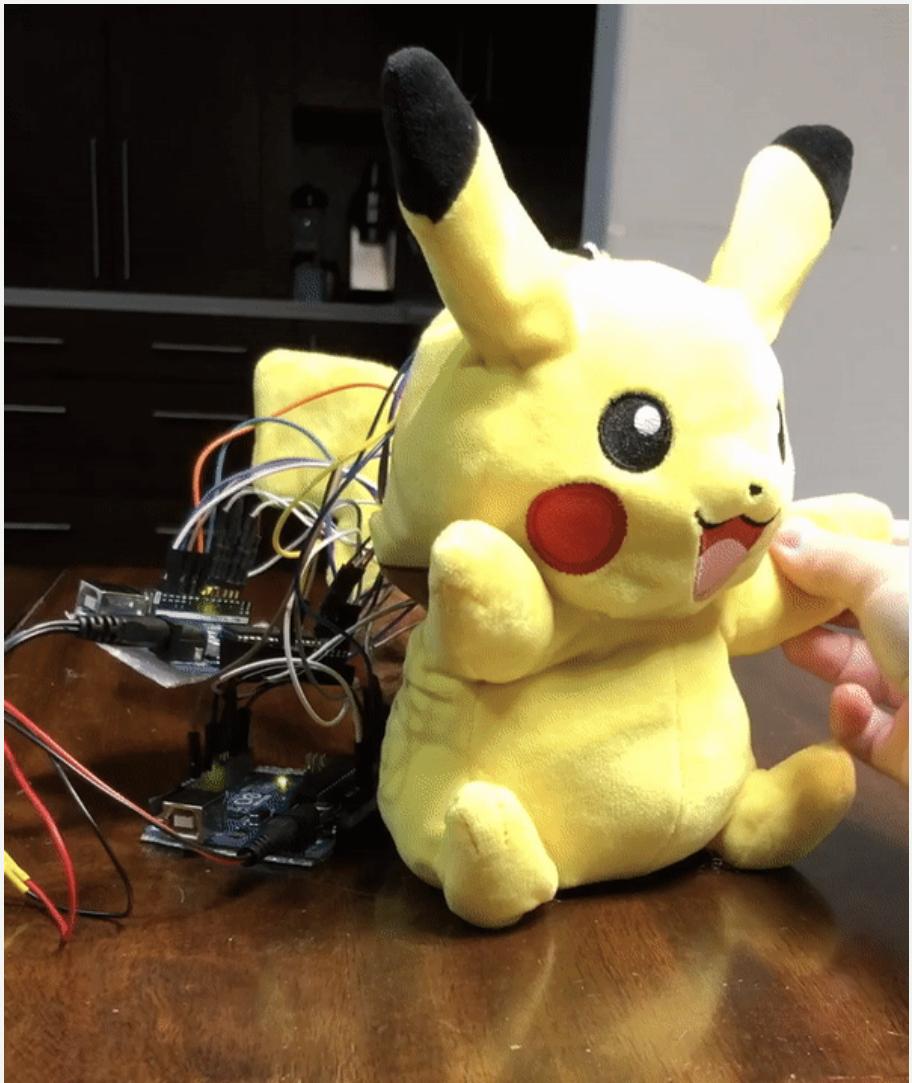




Happy Pikachu! Reaction

Initiated by Right Button Press and
Remote Control Button 2

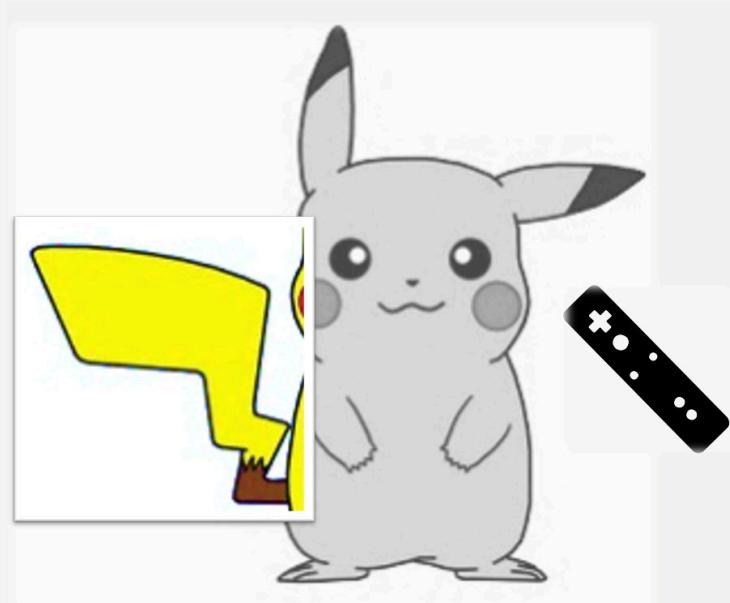
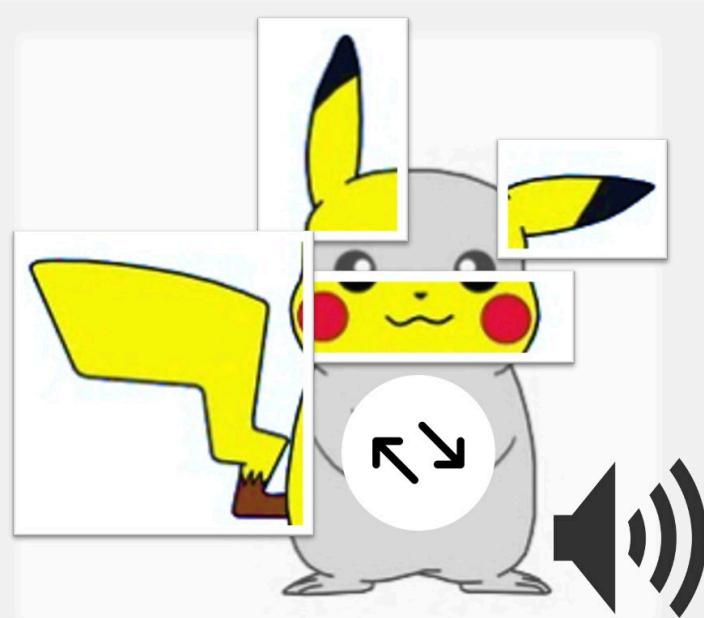




Annoyed Pikachu Reaction

Initiated by Left Button







IMPROVEMENTS?

- More compact design
- Different Arduino motherboard
- Cleaner code



QUESTIONS?



CITATIONS

- 21, Mustafa February, and Paul May 30. "Venn Diagram with 4 Circles for PowerPoint." *The Free PowerPoint Template Library*, 9 Dec. 2018, www.presentationgo.com/presentation/venn-diagram-with-4-circles-for-powerpoint/.
- Anuwat. "PNG Images." *Pngtree*, pngtree.com/free-png?source_id=63&chnl=ggas&srid=752076878&gpid=38126922183&asid=423754849671&ntwk=g&tgkw=kwd-442258019674&mchk=freepng&mcht=b&pylc=9032176&dvic=c&gclid=Cj0KCQjw6575BRCQARIaAMp-ksPQypAkWXngFK6_d_YDwtyjZQFnJfgl0smjBnymeV8EPfedLYpxHF8aAnOEEALw_wcB.
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