EE183DA Lab 3
Band Fred
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Introduction:

In this lab, we are going to integrate the three instruments from individual lab2 into a band that could play together. In this band project we are using sensors to measure signal sent from other instruments and respond to those signals.

Results:

Our Band Fred consists of three instruments. They are each controlled by an MCU, and use servos to hit on stuff and make noise. Users can send commands to the first instrument through Wifi, it will then trigger the second instrument, which will also trigger the third instrument and the whole band will play together.

Figure 1: setup of Band Fred

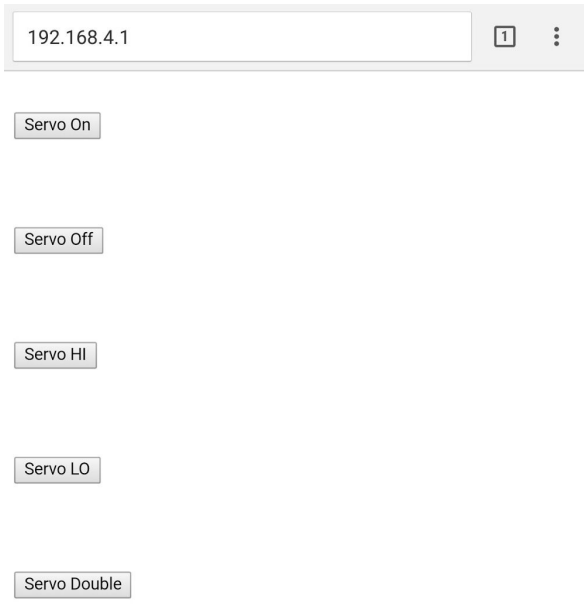

Figure 2: user interface of Band Fred

The first instrument consists of a servo motor with a bar attached to it, controlled by the ESP8266 MCU. Basically, the MCU will send a signal to the servo motor, and the motor will swing back and forth to hit the cup and the switch. When the switch is hit by the bar, it's going to send a signal to the next stage of instrument. We also setup the MCU as a WiFi access point, where we can use our devices like laptops and cellphones to connect to it and give commands. When we apply power to the MCU, the servo motor will not start automatically until the 10 second countdown is done, or until someone is connected to it through WiFi and give further commands. The user interface is on a website. When users connect to the WiFi and go to http://192.168.4.1/ using their web browser, 5 buttons will show up on the webpage. (Figure 2) The first two buttons are 'Servo On' and 'Servo off', they change the state of the servo motor as a switch to control our instruments. The other two buttons('Servo Hi' and 'Servo Lo') will set the servo motor to the highest angle where it can hit the switch or the lowest angle where it can hit the cup. These two buttons help us to test functionality and calibrate position for our instruments. There is another button called 'Servo Double', if you click this button, the servo will swing at a faster rate for 10 times and then return to the previous state. With that set up, whenever the servo move to its 'high' position, it's going to

hit the switch, which triggers the next stage of our instrument. Also, when it moves to its ‘low’ position, it hits the plastic bottle to make some more sound.(Figure 3)

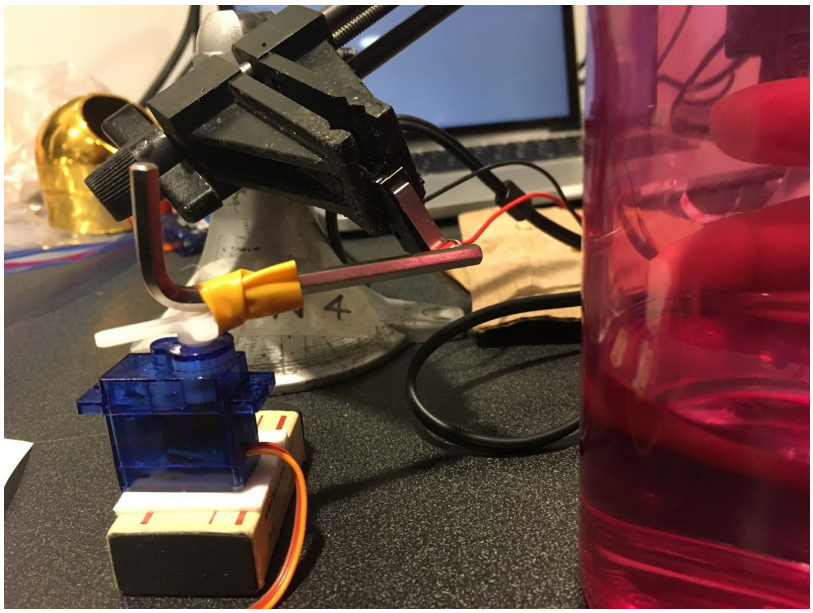

Figure 3: illustration of the first instrument

The switch is connected to the MCU of the second instrument. When the MCU reads high, it will command the servo to rotate up to 60 degrees and then rotate back where we place a spoon and then can make noise. There is a vibration sensor attached to the end of the arm, which is off when the arm is at its horizontal position and turns on when the arm rises.

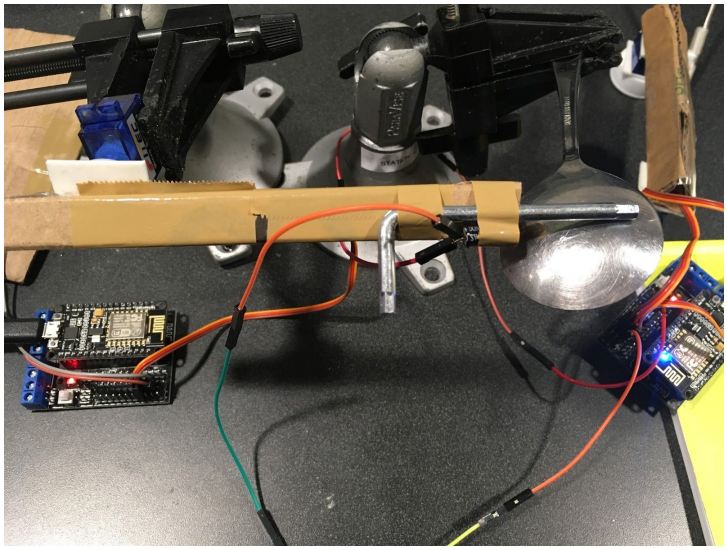

Figure 4: a close look at the second instrument

The third instrument take the signal from vibration sensor mounted on instrument 2, when the arm of instrument 2 raise above 45 degree, a high signal will sent to instrument 3, and instrument 3 will move to next pitch and hit this pitch once. Generally, this instrument has two different pitches to play. Pitch are defined by the amount of water in a glass cup. The mechanism use one servo motor to control the position of arm and use another servo motor to rise the metal arm 45 degree and hit down.

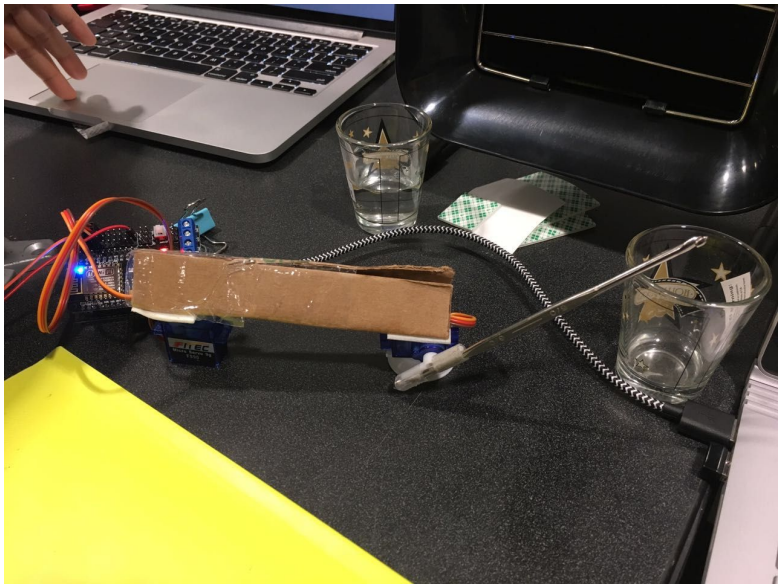

Figure 5: picture of the third instrument

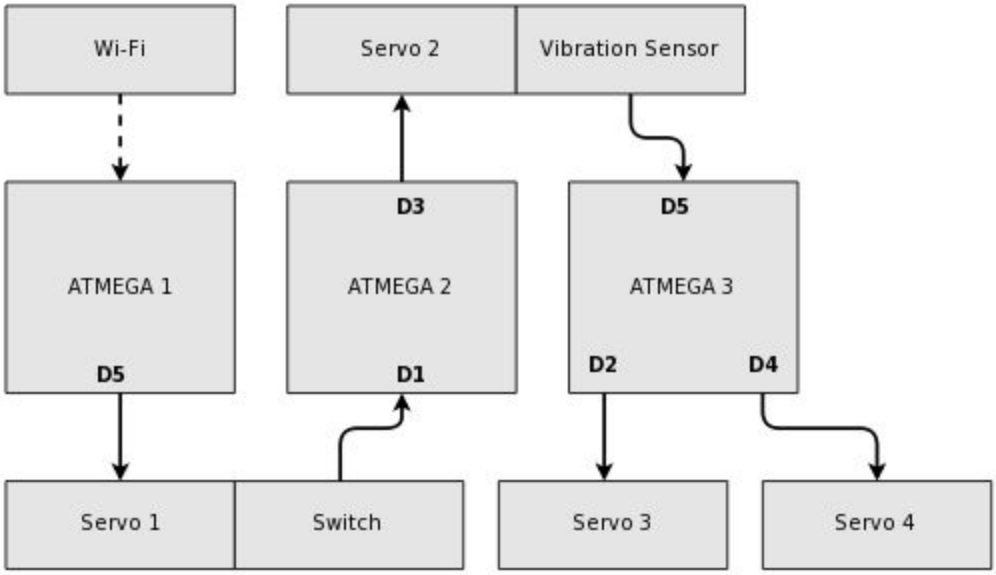

Figure 6: schematics of project.

Name	Model	Quantity
Microcontroller	ESP8266-12E	3
Micro Servo (regular)	FS90	4
Moto Shield	ESP-12E Motor Shield	3
Limit Switch	10T85	1
Vibration Sensor	SW-520D	1

Table 1: a bill of materials

A live performance of our band can be found on Youtube: https://youtu.be/NavZ0dLaNok.