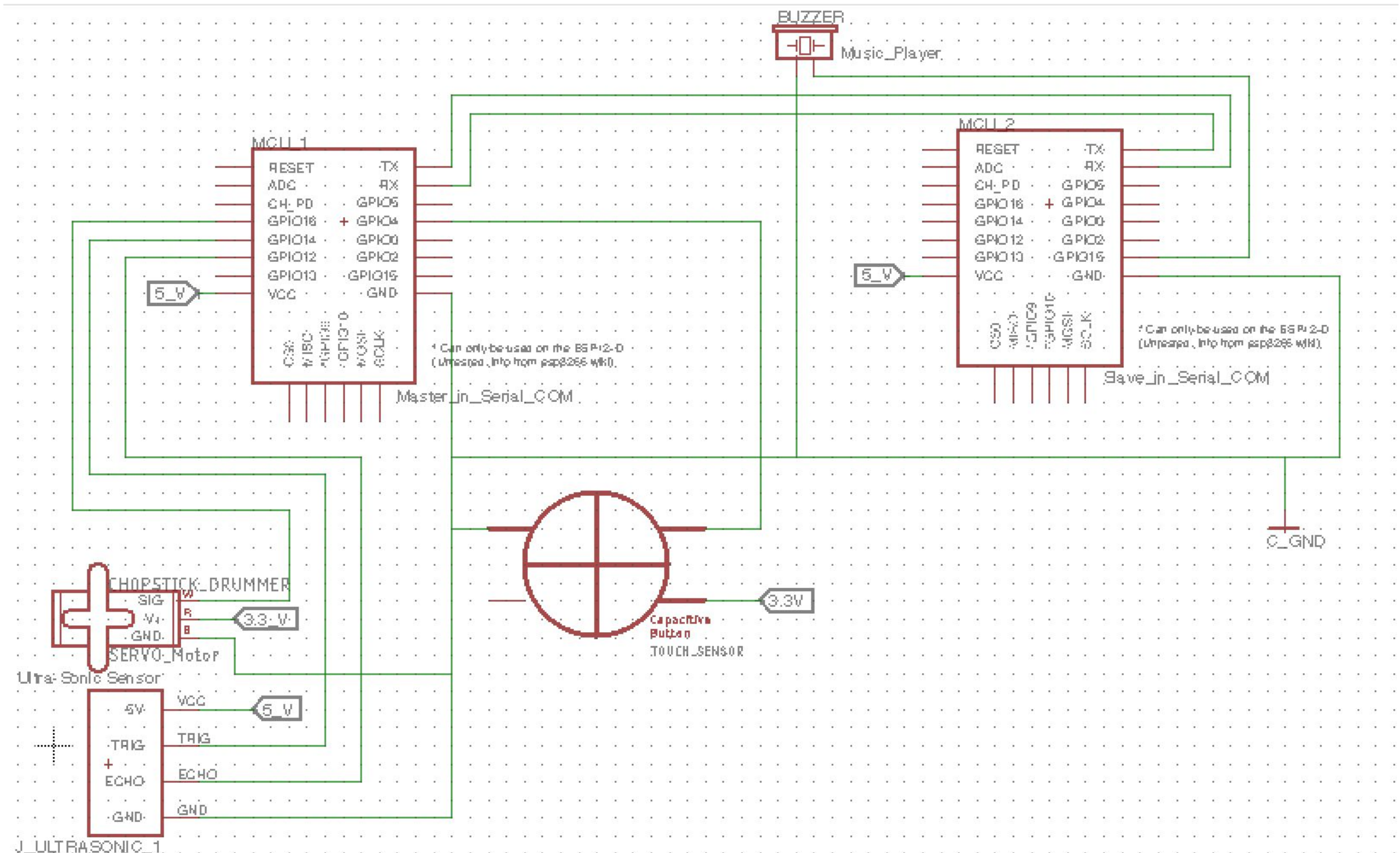


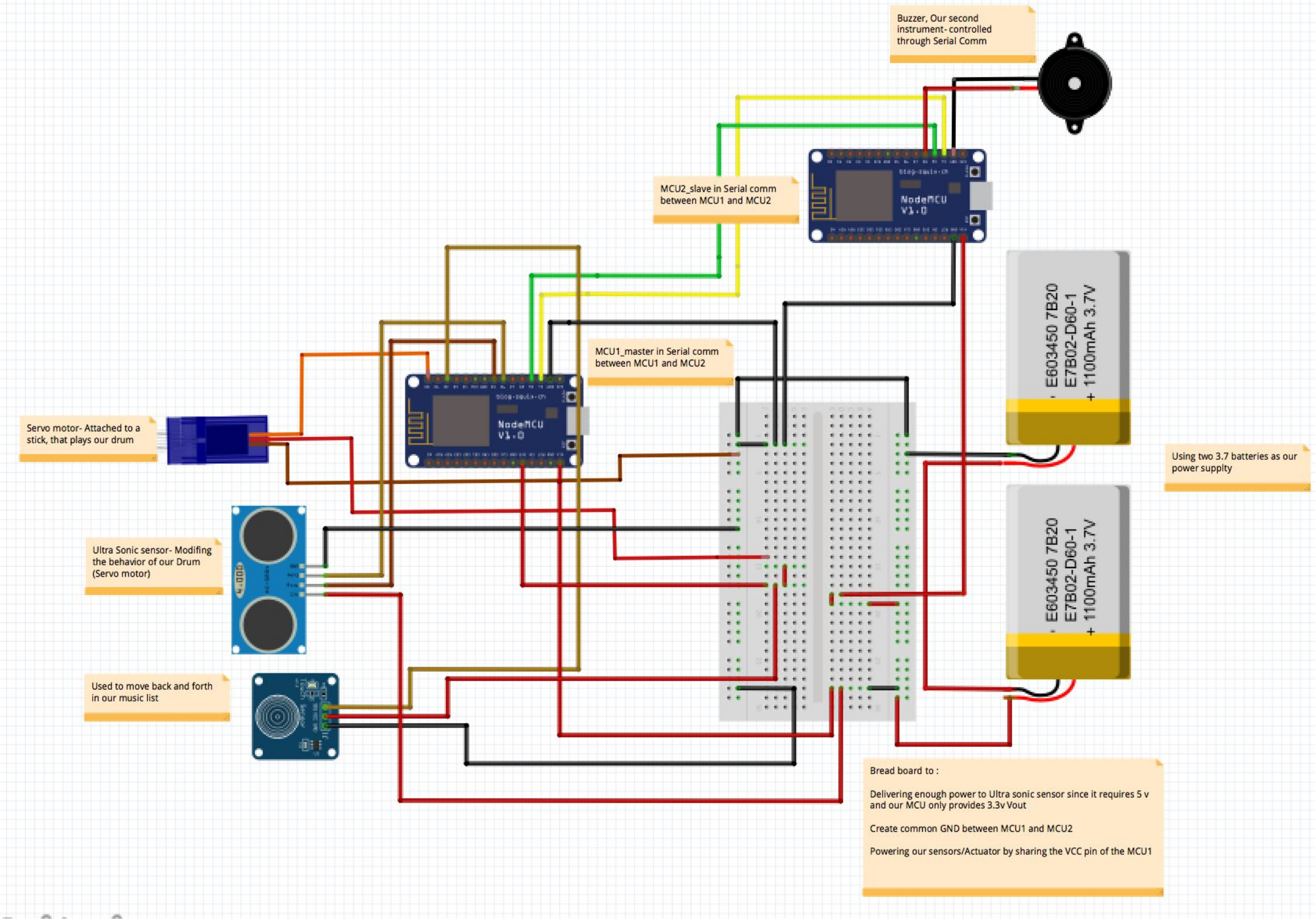
Abstract

The main idea of this lab was to build an electromechanical musical band driven by ESP8266 micro-controller with the use of sensors and actuators. The band was then required to be functional both in autonomous and human-controlled modes. It would be commanded through an internet-based web interface. The band would also have interaction with sensors to to analyse and measure the state and would respond to possible changes using actuators.

System Description



System Schematics



Mechanical Drawing

System shown above is the jam band including two MCUs (ESP8266), two actuators (Servo motor and Buzzer) and two sensors (Capacitive touch sensor, ultrasonic Sensor). Our first instrument, consists of a servo motor with a chopstick attached to it which based on the rotation angular velocity of servo hits the bottom of a plastic to mimic the behavior of a drum in the band. Two MCUs talk to each other through serial communication (RX1 → TX2, TX2 → RX1 - MCU1 being the master and MCU2 slave)

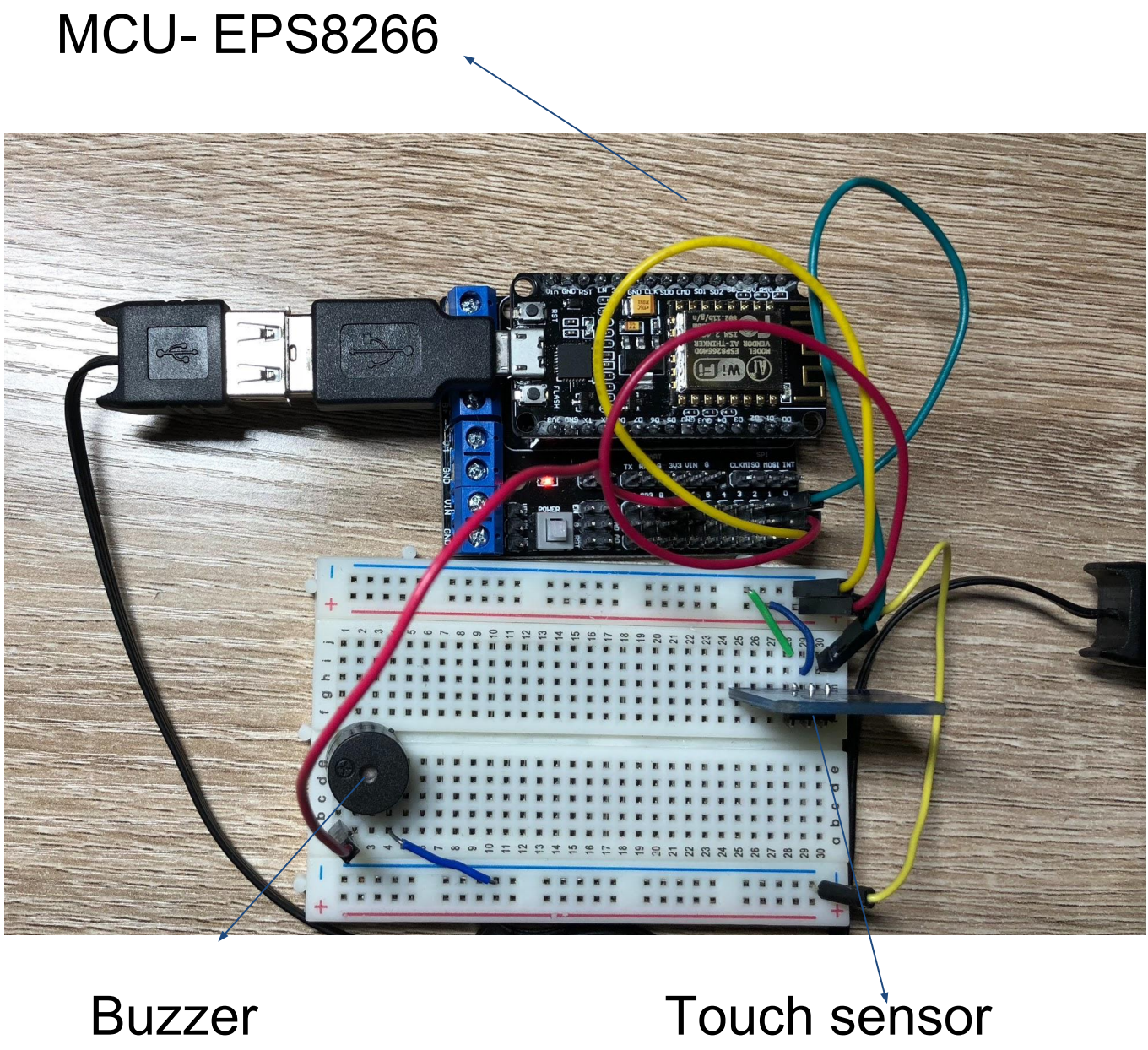
In the autonomous mode, our website interface commands MCU1 (Access point) to play either of two music options available with two different tempos (slow and fast). Therefore there would be four possible combinations to choose from, then its MCU1's job to call MCU2 (through serial communication) and initiate playing the same song in harmony with the instrument of MCU2.

As the mechanical drawing and schematics show, MCU1 controls the drum (servo motor), has both sensors ultrasonic and touch enough sensor and makes sure both the instruments are played in harmony. MCU2 however, controls only the buzzer (our second instrument) and it receives signals from MCU1 through serial communication.

Personal contributions, methods and results

Below is the list of my contributions on the project:

- Design and build instrument Number 2 :
  - Sensor → Used touch sensor (Each time the touch sensor is pressed it would move to the next song)
  - Actuator → Buzzer:
    - Modifying two buzzer codes for the two songs the jam band play: (Sources of the code were online )
      - Twinkle Twinkle
      - Row Row Row the boat
    - Working on harmonizing drum beat with the rhythm played by buzzer
    - Implementing the means of communication between the two MCUs → Serial Communication
- Do the mechanical Drawing in Fritzing and Schematics in Eagle. (Shown above )
- Recording the demonstration video.



Further Development and Potential alternatives

Further Development:

We may add more songs into our archive. More features can also be added to be controlled for example, beat, rhythm and ... . We could also add more instrument and make them communicate through Wifi network rather than using Serial communication.

Potential alternatives:

I really wanted to have a switch button with an LED indicating in which mode the system is operating. For example, if in Autonomous mode one may press the button to go to interaction mode. As for now our system switch between autonomous and interaction mode based on the data received either on server or through sensors. Also Interaction mode could have been involved with touch sensor, like changing the tempo of music based on the number of times the touch sensor is pressed.