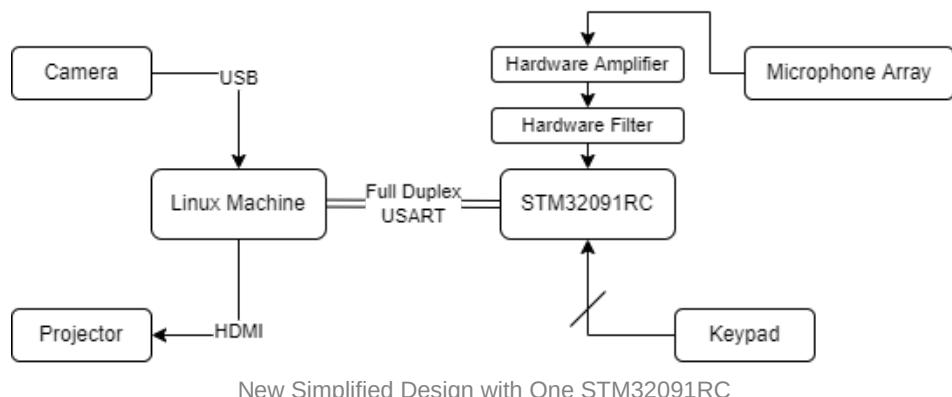


3

Week 3

Overall Design:

After discussing with course staff we have decided to redesign our project to make use of only one STM32091RC instead of two.



New Simplified Design with One STM32091RC

Amplifier Circuit:

We rebuilt an amplifier circuit to see any difference in the output on the piezo microphone.



Amplified Microphone Signal after Ball Bounce on Table

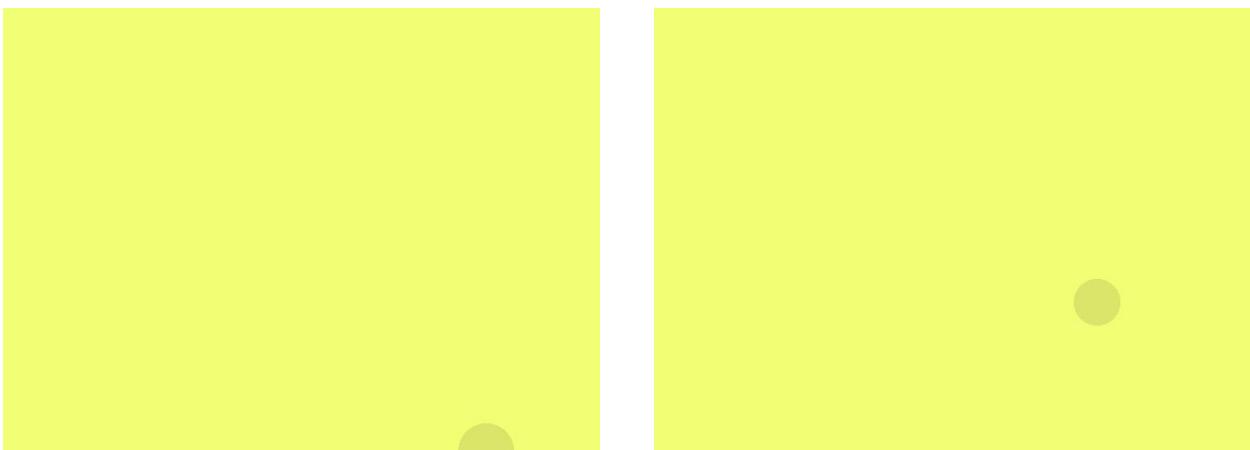
After discussing with the course staff we realized that the microphone alone has the ability to output extremely high voltage.

- After further testing we discovered that the voltage can reach levels of up to 40V.
 - This could explain the nonexistent amplification we observed
- An amplifier circuit may not be necessary

OpenCV:

Generated Test Images:

In order to test the functionality of openCV, specifically blob detection, I generated a variety of simple images of a circle on screen:



Two Images from the Small Generated Dataset

Blob Detection:

Used [simple code](#) to test the functionality of opencv's blob detection.

```
int main(int argc, char** argv) {
    Mat im = imread("/home/rachel/Pictures/Random-On-Screen/0.tif", IMREAD_GRAYSCALE);

    Ptr<SimpleBlobDetector> detector = SimpleBlobDetector::create();
    std::vector<KeyPoint> keypoints;

    detector -> detect(im, keypoints);
    Mat im_with_keypoints;
    drawKeypoints(im, keypoints, im_with_keypoints, Scalar(0,0,255), DrawMatchesFlags::DRAW_RICH_KEYPOINTS);
    imshow("keypoints", im_with_keypoints);
    waitKey();
}
```

The results of this test were not accurate and could not locate the circle.

UART from laptop:

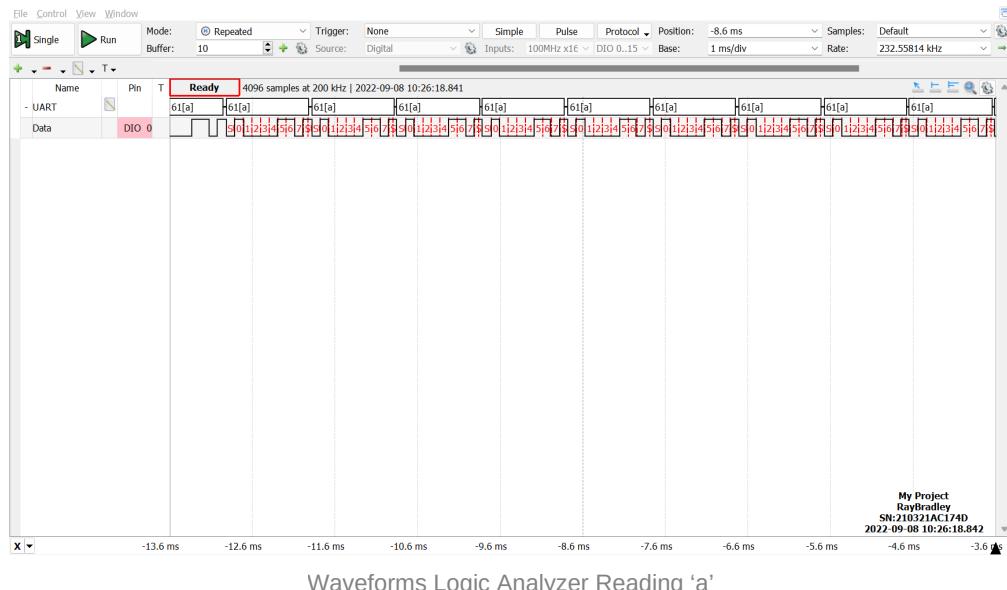
Tested pyserial:

PySerial is a library that allows for simple interfacing with a serial port.

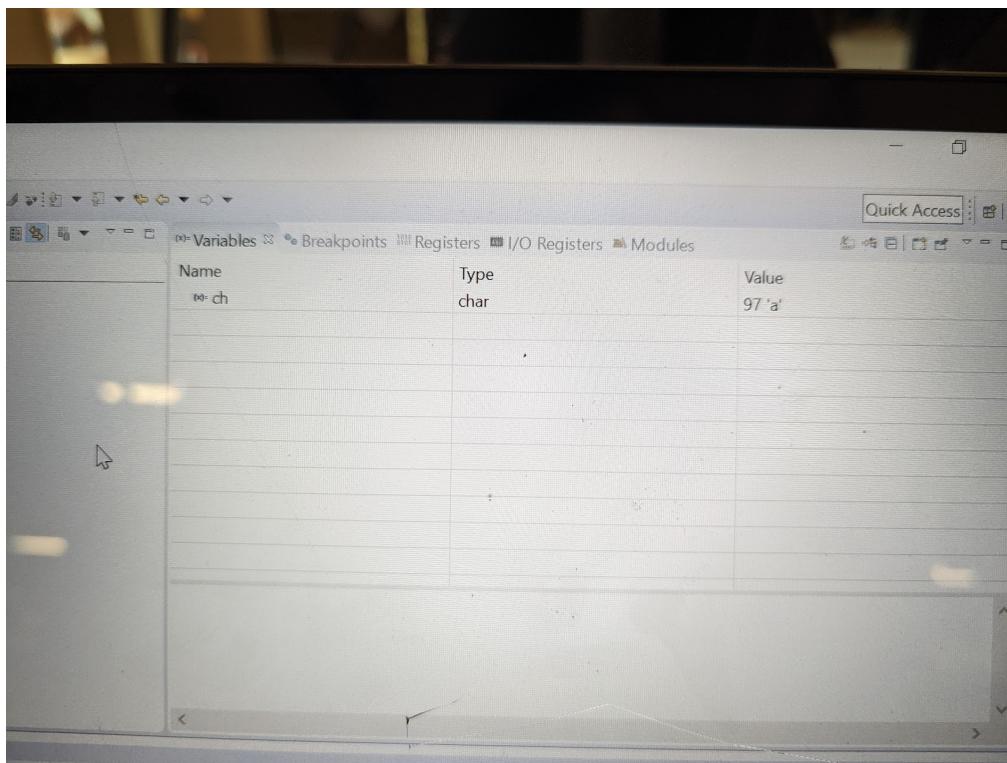
- Terminal devices on Linux
- Com ports on windows

Tested a simple communication of a single character 'a' using a python script:

```
import serial
ser = serial.Serial('COM3')
print(ser.name)
i = 1
while i == 1:
    ser.write(b'a') #formatting the message
    s = ser.readline()
    #print(s) #this will decode the message and create graphical elements based on message
ser.close()
```

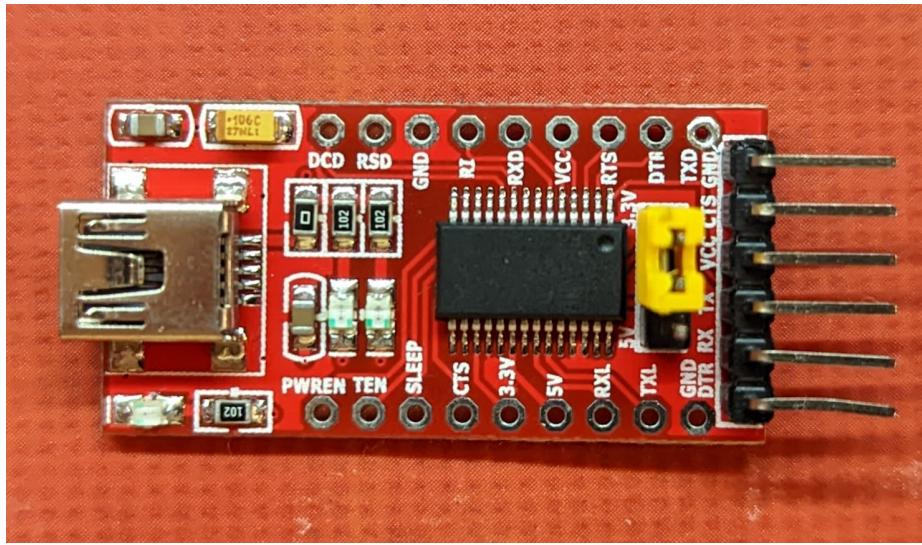


Waveforms Logic Analyzer Reading 'a'



Microcontroller Reading 'a'

This simple communication was sent using the usb to serial bridge [ft232rl](#):



FT232RL USB to Serial Device

Next Week:

OpenCV:

- Continue to test blob detection and tweak parameters until we can reliably detect each circle in the data set.
- Look into what modifications need to be done to the blob detection algorithm to take depth data instead of color data.
 - If this is impossible or not feasible (or I am lazy) see what it will take to translate the depth data to a color video stream.
- To get more valuable test data, set up ping pong table on its side and the camera to film the table and a ball bouncing in frame. Hopefully with this we can test on data that look more like the real use case.

Buck Converter:

- Find information of Buck converter designs.
- Prototype and test a 12V - 3.3V buck converter.

UART From Laptop:

- Start to develop the message protocol between the laptop and the micro.
 - This will include a request message that will ask the micro controller for either a ball bounce or user input.
- Write directly to /dev/tty file in linux and figure out how to configure the serial connection without using a script.
- Try to integrate USART messaging code into the opencv code.