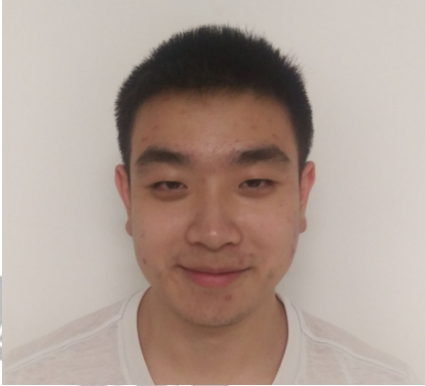


So-Lo Team 12



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● Ming Shuai Chen (CSE)



Suzet Nkwaya (EE) ■



▲ Dan-Michael Tiamzon (EE)

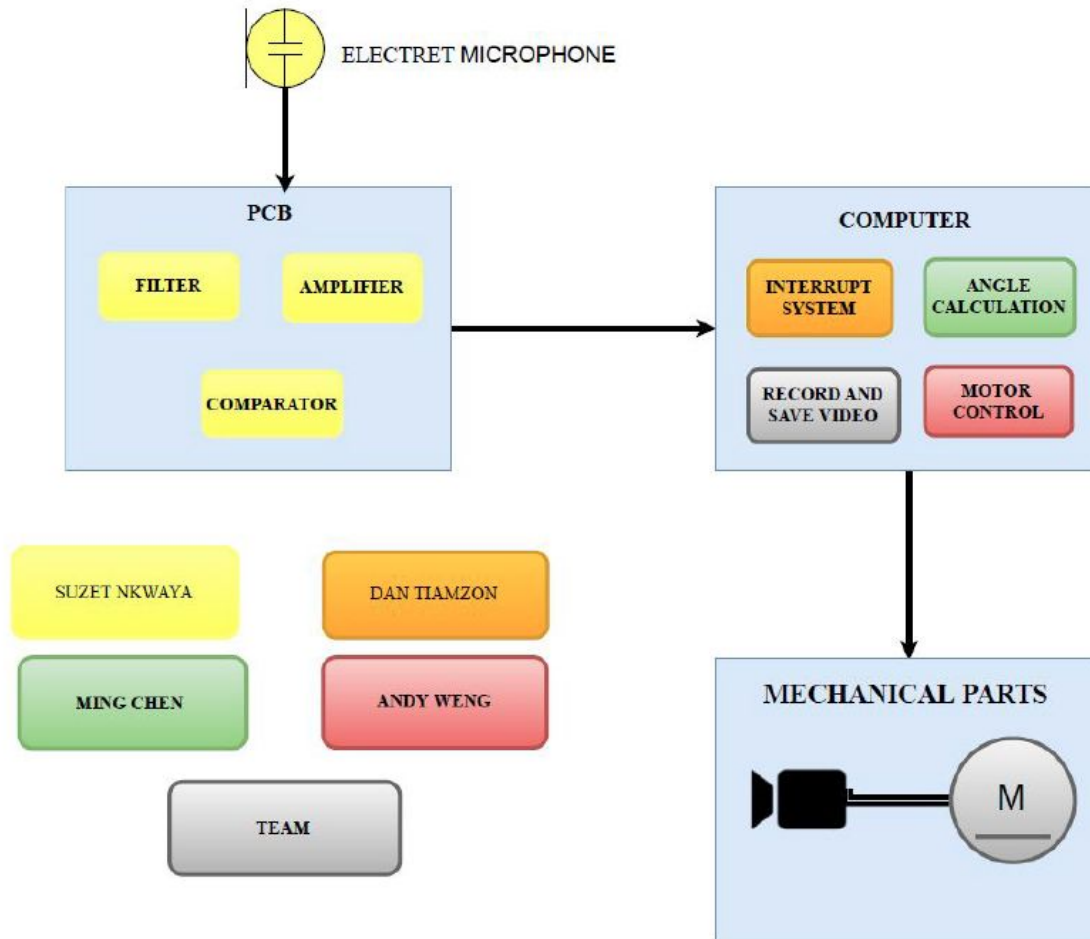
Presentation Overview

- Review of the Project
- CDR Deliverables
- Demo
- FDR Deliverables

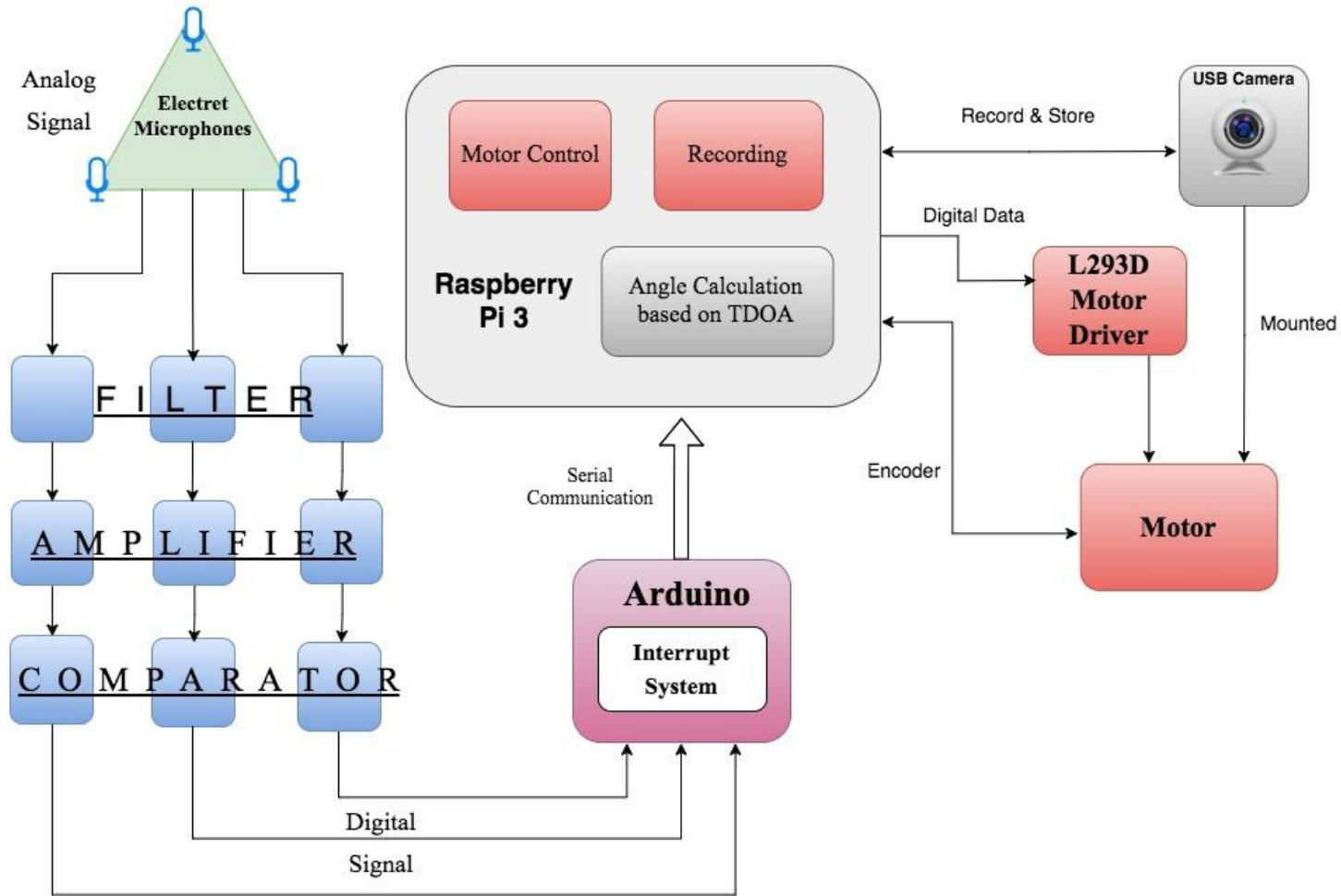
So-Lo

- Real-time sound locator
- Camera mounted on a rotating stand that points to the location of sound
- Effective for small to medium-sized room

Previous Block Diagram



Block Diagram



System Requirements

- Calculate source of sound based on time differences between microphones located at a known position.
- Microphone Array
 - Detect sounds from 3 feet away
 - Amplify voice and filter out noise.

System Requirements

- Raspberry Pi
 - Use microphone array outputs to calculate sound source location
- Motor
 - Receive commands from Raspberry Pi
- Camera
 - Record video and save data on SD

CDR Deliverables

- Demonstration of Complete System Functionality
- Place the microphone arrays in an equilateral triangle
- Detect voice from 3 feet away
- Motor will respond and turn to the angle produced by the angle calculator
- Record and store 30 second video on SD card

Current System Functionality

- Each individual subsystem working
- Interrupt system determines the time differences between the microphones
- Motor will turn when microphones detect sound
- Works accurately when time differences are calculated correctly
- Can record and store video on Raspberry Pi SD card

Problems Encountered

- Latency in interrupt response time from Raspberry Pi
 - Inaccurate time differences
 - Throws off angle calculations
 - Motor points to the wrong direction
- Get all three microphones to detect the same signal

The importance of immediate response

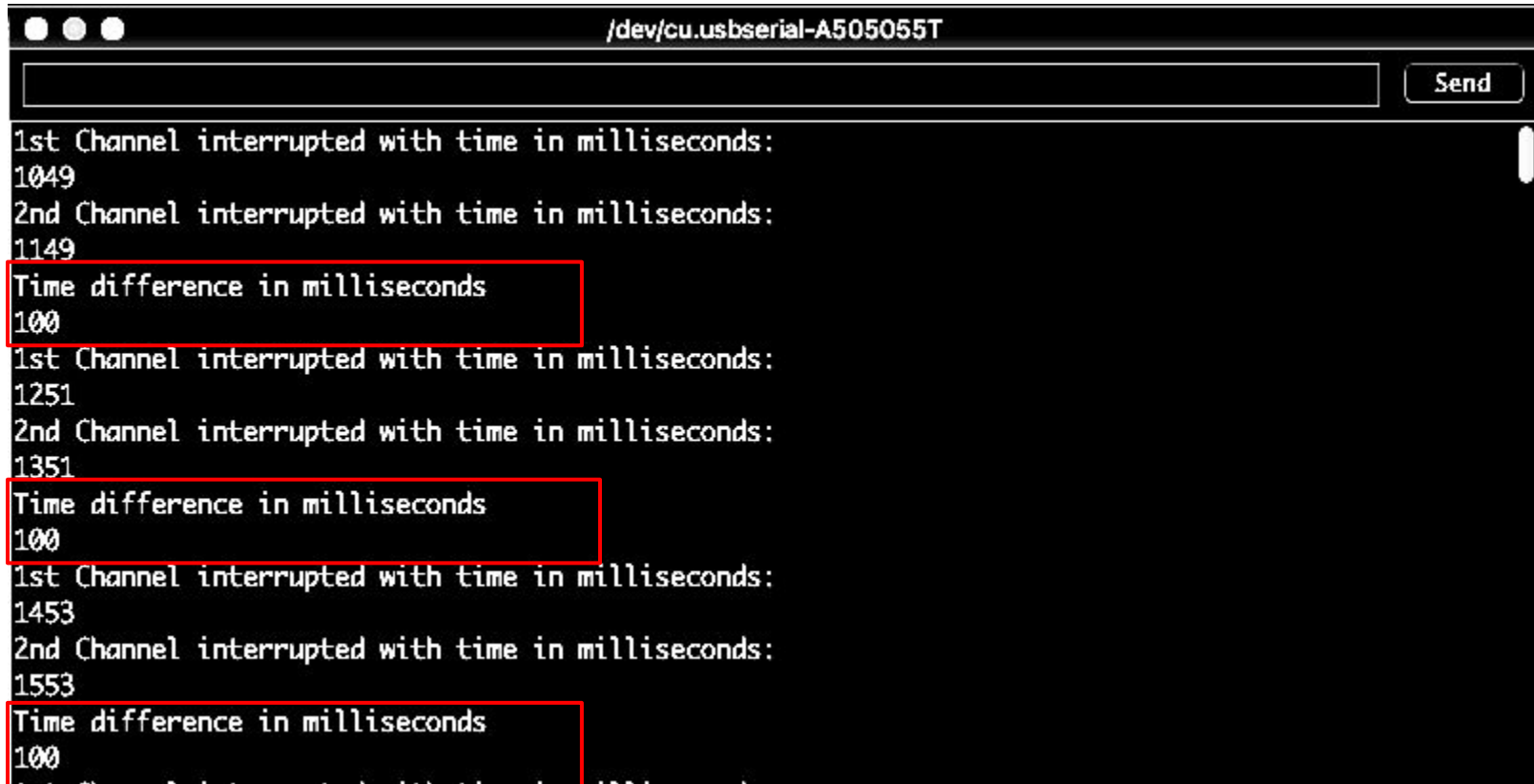
- Ideal test signals with known time differences
 - Generated from Arduino
 - Clean, ideal signals
 - Signals observed by Logic Analyzer



Raspberry Pi GPIO Pins vs Arduino Pins

```
-----  
arrived on 23  
arrived on 24  
['23', '24']  
time difference between 1st and 2nd mic  
0.1101770401  
-----  
arrived on 24  
arrived on 23  
['24', '23']  
time difference between 1st and 2nd mic  
0.775115013123  
-----  
arrived on 23  
arrived on 24  
['23', '24']  
time difference between 1st and 2nd mic  
0.0483748912811  
-----  
arrived on 23  
arrived on 24  
['23', '24']  
time difference between 1st and 2nd mic  
0.189399957657
```

Raspberry Pi GPIO Pins vs Arduino Pins



A terminal window titled `/dev/cu.usbserial-A505055T` displays the output of a program measuring the time difference between two channels. The output is as follows:

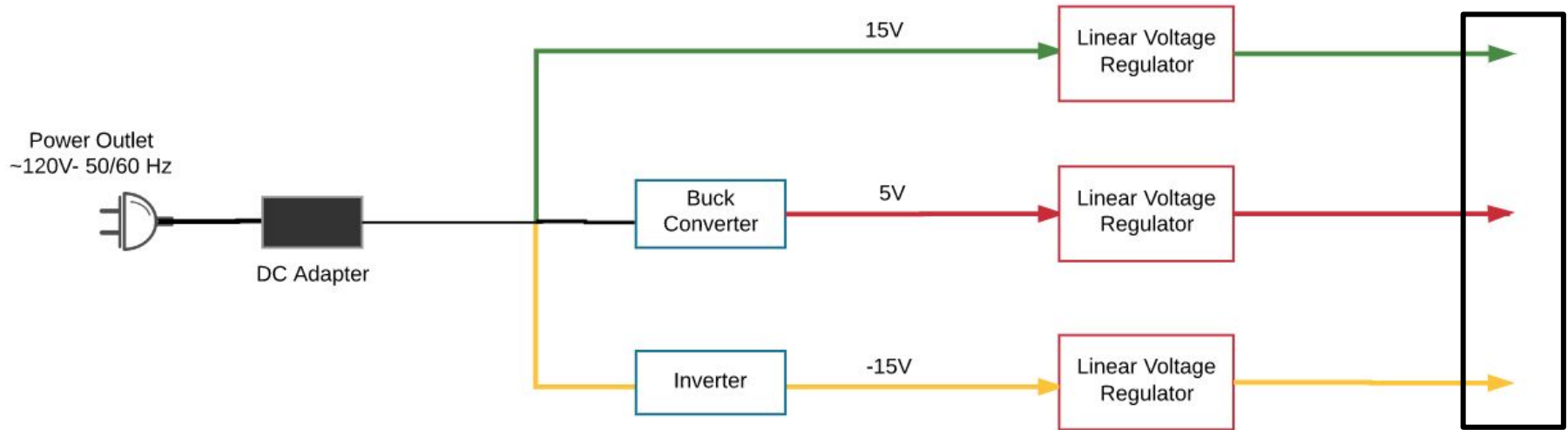
```
1st Channel interrupted with time in milliseconds:
1049
2nd Channel interrupted with time in milliseconds:
1149
Time difference in milliseconds
100
1st Channel interrupted with time in milliseconds:
1251
2nd Channel interrupted with time in milliseconds:
1351
Time difference in milliseconds
100
1st Channel interrupted with time in milliseconds:
1453
2nd Channel interrupted with time in milliseconds:
1553
Time difference in milliseconds
100
```

The three "Time difference in milliseconds" lines are highlighted with red boxes, each showing a value of 100.

Solution

- Use Arduino instead of Raspberry Pi for interrupt system
- Arduino
 - No operating system
 - Interrupts respond almost immediately
 - No need to worry about Raspberry Pi overheating
- Communication between Arduino and Raspberry Pi

Preliminary Design of Power Supply



CDR Demonstration

- Demonstrate complete, flow of power, data and/or information among subsystems.
- Demonstrate the camera recording and storing video on Raspberry Pi SD card
- Demonstrate a working case (time differences are accurate)

FPR Deliverables

- Full System Integration
- Accurately point to the source of sound (speaker)
- Microphones assembled (something other than cardboard)
- Filter, Comparator, and Amplifier assembled on PCB
- Power Supply for system assembled on PCB

Questions



Demo Video Back-up

