

Therapalz Collar

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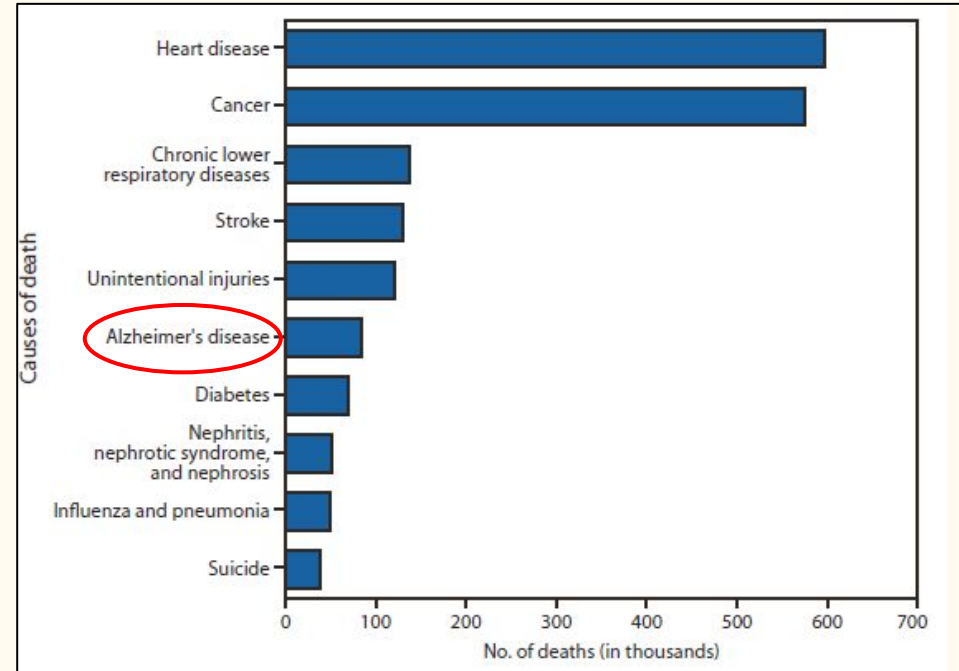
Overview of Presentation

- Background & Introduction
- Overall features of project
 - Physical Design
- Overview of System
 - Power System
 - Microcontroller
 - Sensors
 - Speaker
 - Communication System
- Conclusions
- Future for Project



Background on Alzheimer's Disease

- Alzheimer's affects over 5.7 million people in America yearly
- Sixth leading cause of death in the US
- Alzheimer's is an incurable disease



Where does our project come in?

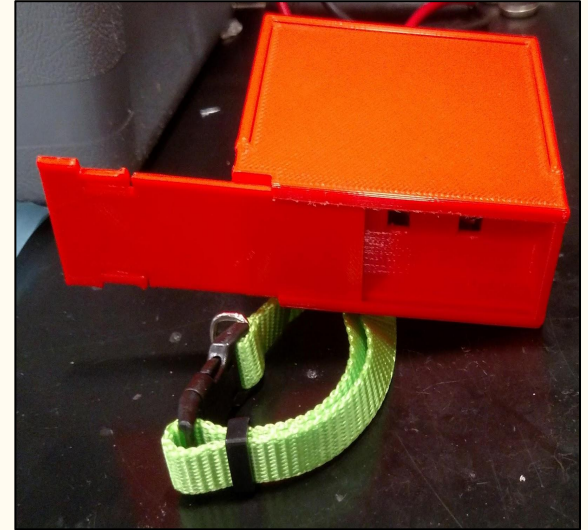
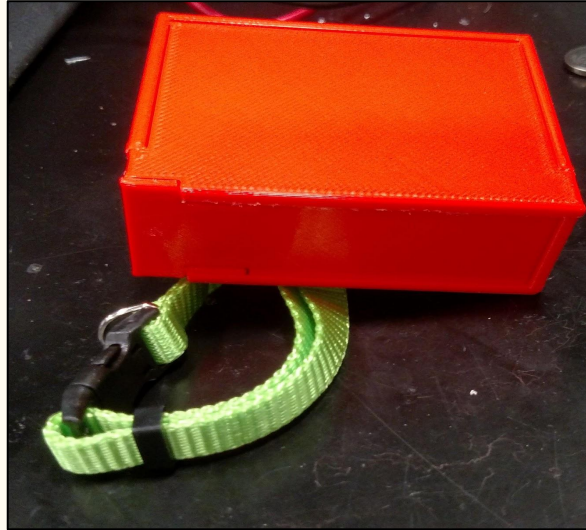
- Pets are a great companion for patients
- Difficult to look after
- Therapalz is a **smart companion stuffed-animal**
- Proposed in class by Ms Fiona Kalensky
- We proposed to make a **smart collar** for the animal

Features of Collar

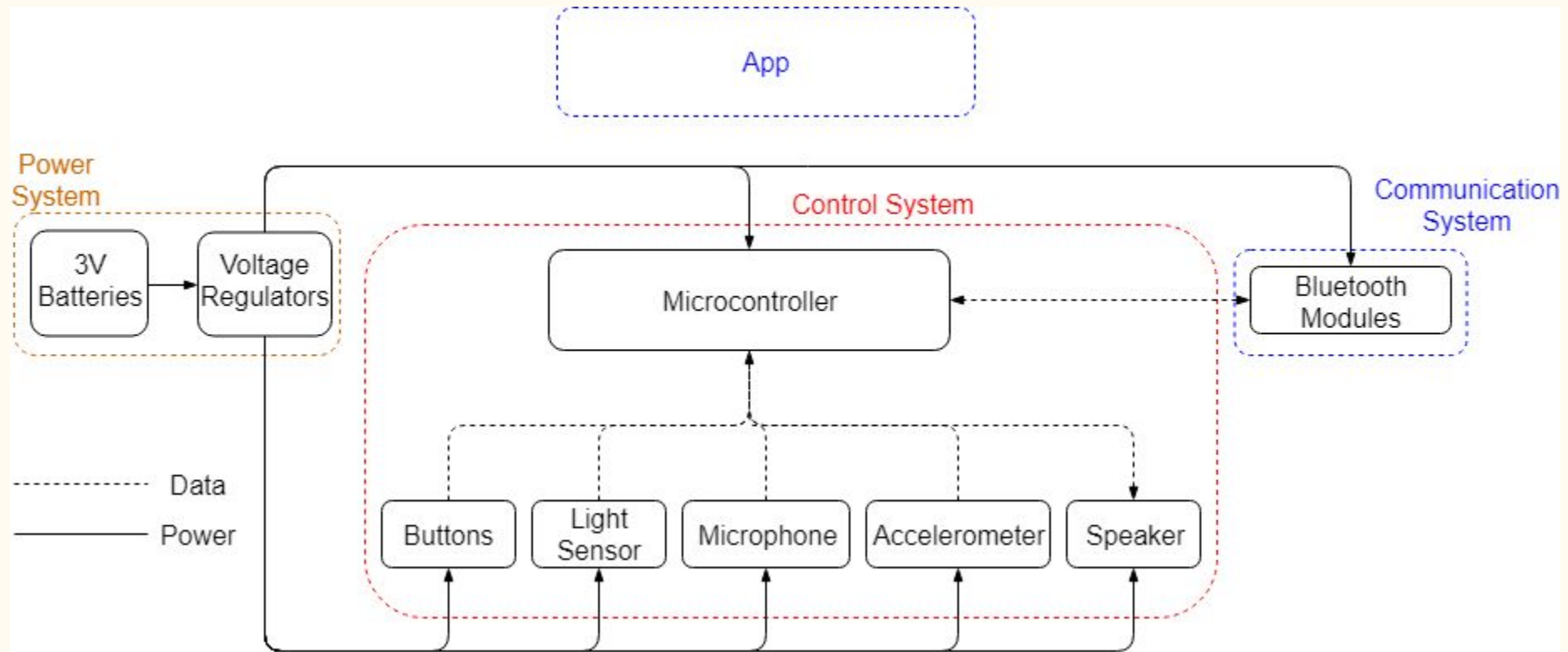
- Physical design
- Light sensor
- Motion sensor
- Microphone
- Speaker & Bluetooth for location tracking

Physical Design

- Concealability
- Security

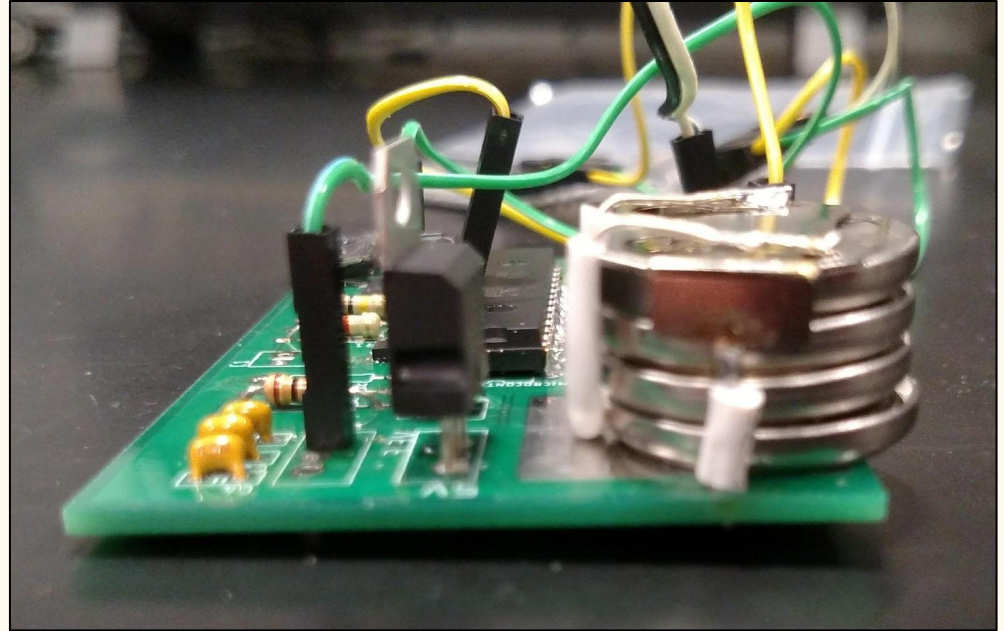


System Overview



Power System

- 6V from batteries
- Two voltage regulators
 - 5V - Microcontroller and Bluetooth
 - 3.3V - Sensors



Power System Successes & Failures

- Successfully power microcontroller and Bluetooth modules
- Redesign changed power requirements
- 3.3V voltage regulator burned out

Microcontroller

- Read sensor data
- Send data through Bluetooth

```
if (BTserial.available())  
{  
    c = BTserial.read();  
    Serial.write(c);  
  
    if(c=='s')  
    {  
        tone(speaker, 440, 1000);  
    }  
    else if( c=='o')  
    {  
        noTone(speaker);  
    }  
}
```

Microcontroller Successes & Failures

- Ran code for sensors and communication successfully
- PCB design made uploading difficult

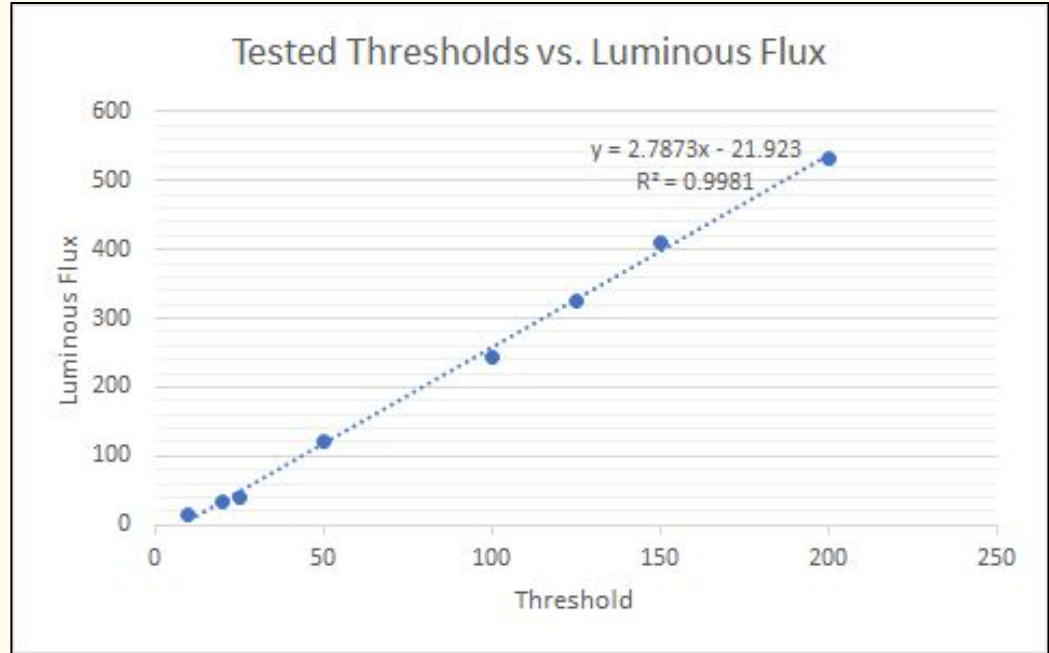
Sensors

- Light
 - Measure lux value of room
 - Determine between normal lighting and darkness
- Accelerometer
 - Measure acceleration of collar
 - Determine if toy is actively moving
- Microphone
 - Measure nearby sound pressure level
 - Determine between normal or loud voice

Light Sensor

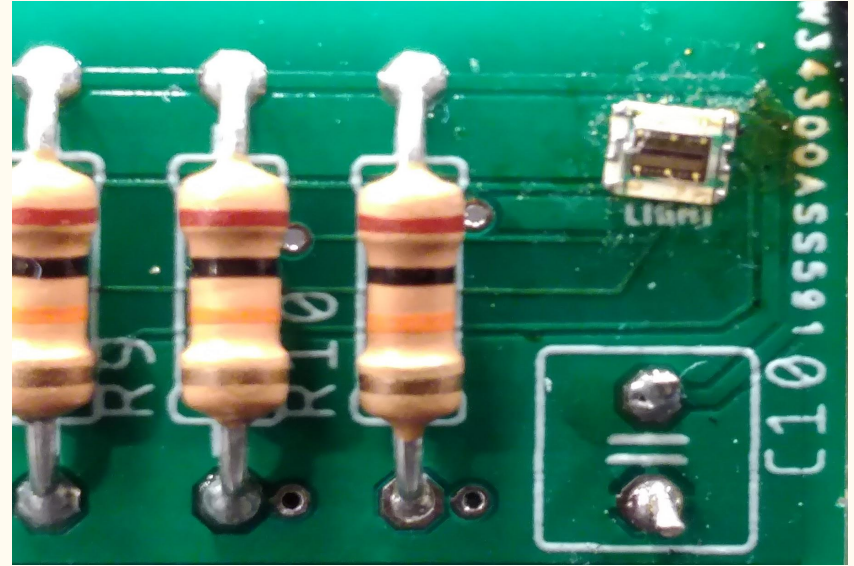
- Tested values used in code vs. received values

```
int lux = apds.readCH0Level();  
if ( lux <= 5 || lux >= 125 )  
{  
  Serial.println("Interrupt");  
}
```



Light Sensor Successes & Failures

- Successfully determined between dark and lit rooms
- PCB design failed



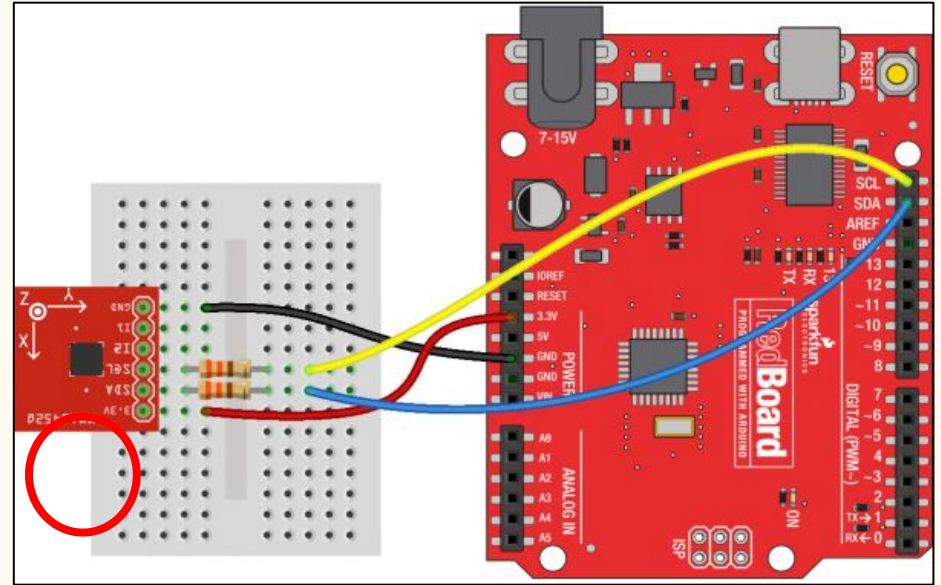
Accelerometer

- Goes to sleep after ten seconds of inactivity
- Wakes up when movement is 0.0625g's or greater

```
10001000
10001000
Wake
Luminous flux: 45
Luminous flux: 45
Luminous flux: 50
Luminous flux: 45
Luminous flux: 50
Luminous flux: 45
Luminous flux: 45
Luminous flux: 45
Luminous flux: 45
Luminous flux: 50
10000000
10000000
Sleep
Luminous flux: 40
```

Accelerometer Successes & Failures

- Successfully enabled auto sleep and wake up
- PCB design failed



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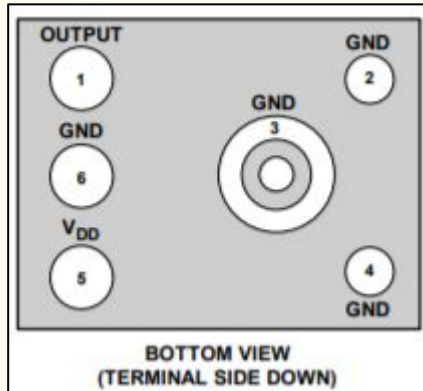
Microphone

- Gather data from Microphone
- Use code to determine loudness

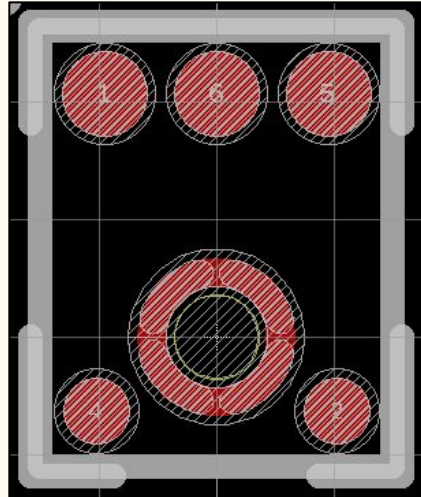
```
if( fill <= 6)
{
    Serial.println("Normal Voice");
    char str1[6] = {'N','o','r','m','a','l'};
    BTserial.write(str1);
}
else
{
    Serial.println("Loud Voice");
    char str2[4] = {'L','o','u','d'};
    BTserial.write(str2);
}
```

Microphone Successes & Failures

- Successfully determined between loud and normal sound levels
- PCB design failed



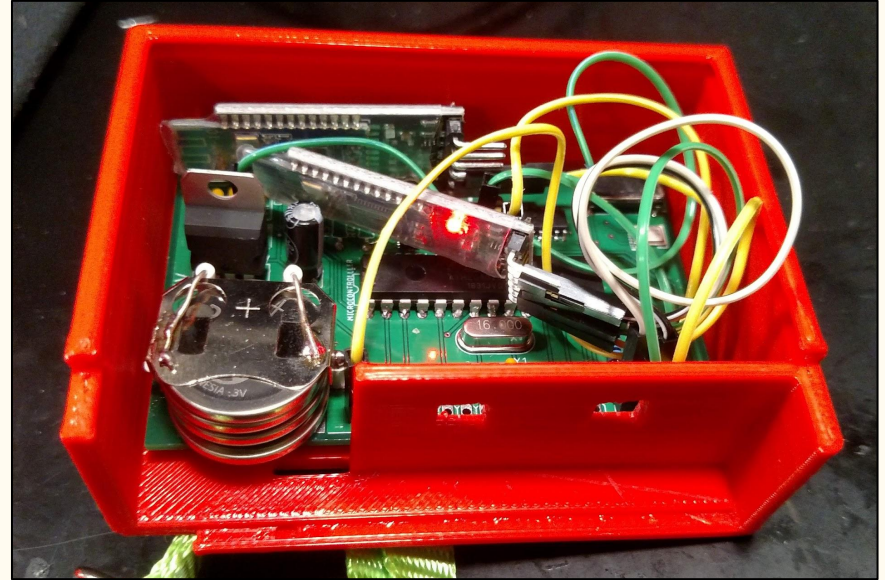
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Connection	
Pin	Pad
G\$1.GND@2	2
G\$1.GND@4	4
G\$1.GND@6	6
G\$1.OUT	1
G\$1.VDD	5

Communication System

- Two Bluetooth modules
- One gathers sensor data and sends it to an app
- The other is an iBeacon



Communication System Successes & Failures

- Bluetooth modules worked as intended
- Their power needs made problems for other systems

Speaker

- Used to locate the animal
- Makes noise on command through Bluetooth



Speaker Successes & Failures

- Made noise when commanded
- Noise was not loud enough for locating

Ethical Considerations

- Battery flammability
- Loudness of speaker may affect hearing of patients
- Issue of Privacy as location and movement of patient is tracked

Conclusion

- All the parts worked individually
- Did not work together as well as hoped



Future for Project

- We will iterate on our design and give it to Ms. Kalensky for further development
- We hope that the collar can be used and have a positive impact on the Alzheimer's community

Thank You!

Resources and References

[1] Murphy SL, Xu JQ, Kochanek KD, “QuickStats: Number of Deaths from 10 Leading Causes” *CDC*, 2010. [Online] Available:

<https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6208a8.htm>. [Accessed December 11,2018]

[2] Jimblom, “52Q Accelerometer Breakout Hookup Guide” *Sparkfun*, [Online] Available:

<https://learn.sparkfun.com/tutorials/mma8452q-accelerometer-breakout-hookup-guide>.
[Accessed December 10,2018]

[3] “ADMP401 Datasheet” [Online]. Available:

<https://www.sparkfun.com/datasheets/Components/General/ADMP401.pdf>