



Zachary DeLuca, Abigail Fellows, Jaycee Johnson, Sydney Schoth

Instructor: Dr. Russell Qualls

Sponsor: Dr. Dev Shrestha

University of Idaho Biological Engineering Department



BACKGROUND

- Multiple team project
 - Engineering
 - Animal
 - Stakeholders
- Current Design is too heavy and consumes too much power
- Current design is based on shock collars and electric fence systems

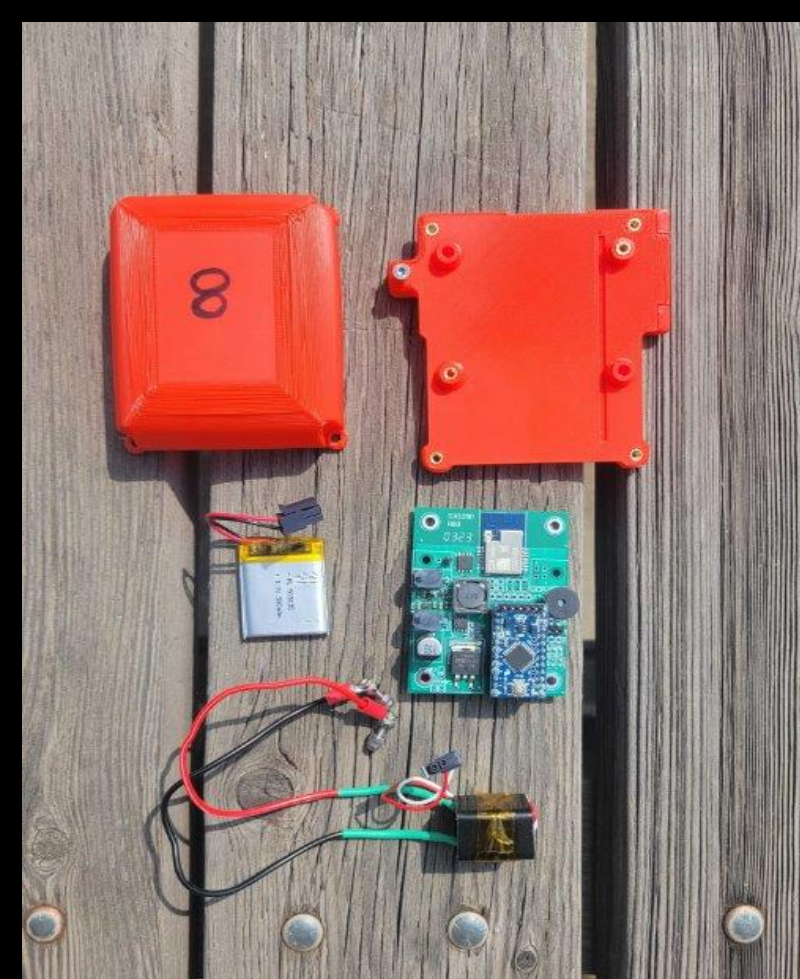


Fig. 1: Current System Design

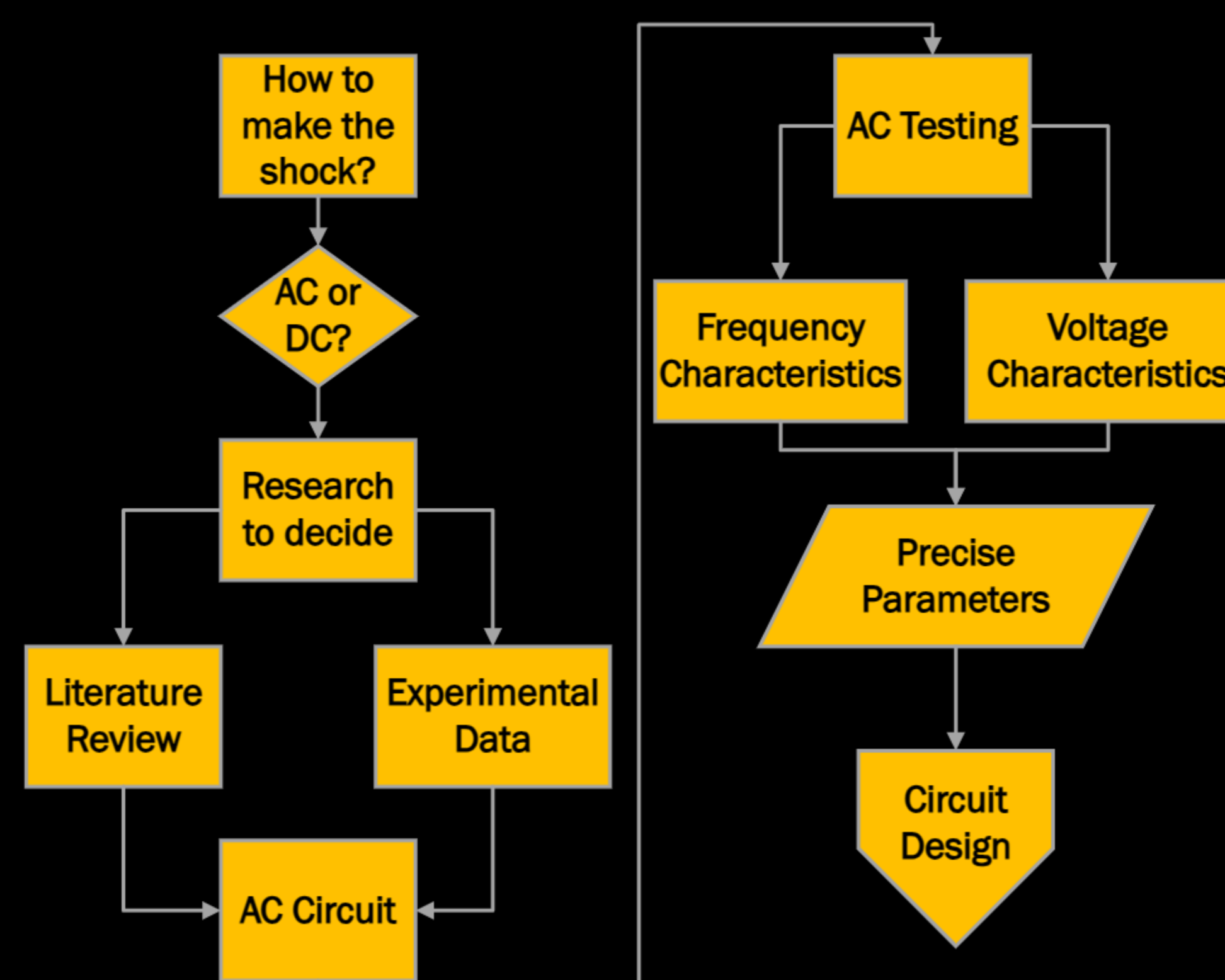
VALUE PROPOSITION

Ranchers spend valuable resources constructing and maintaining fences to control the grazing boundaries of their cattle operations. As these fences are time consuming and difficult to build, the flexibility of the grazing area is lacking. This harms the landscape and decreases livestock production. There is a need for an adaptable system that can control the grazing area borders. A virtual fence system can be remotely operated, allowing ranchers to easily implement rotational grazing systems.

KEY REQUIREMENTS

- To construct a variable shock circuit
- Circuit shall provide feedback after shock is delivered
- Circuit should weigh no more than 15 grams
- System shall fit within a 250 x 100 x 300 mm enclosure
- Circuit is compatible with existing PCB design

CONCEPT DEVELOPMENT



THE FINAL DESIGN

- Transformer – Increase voltage to target range
- Current sensor – Provide feedback on shock delivery
- Gate Driver – Arduino to MOSFET current amplifier
- MOSFET – DC to AC switching
- Diode – Protect components from high voltages

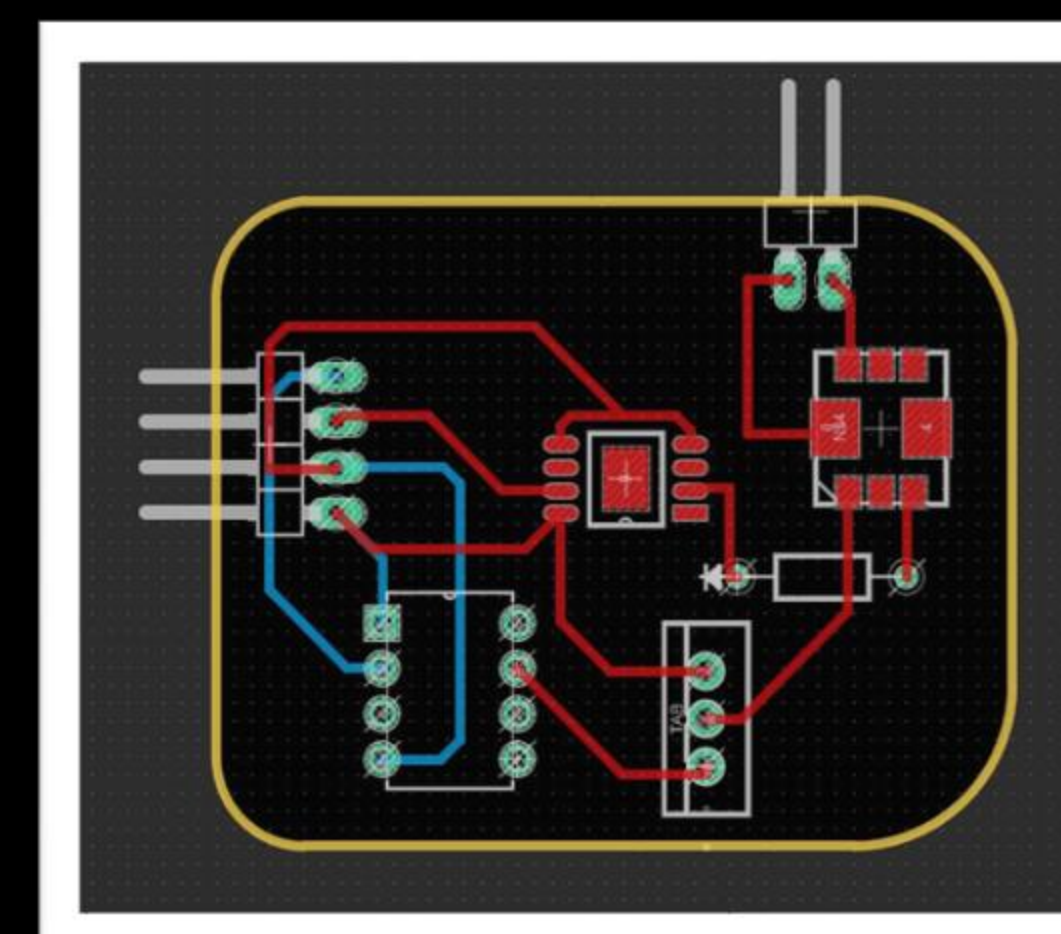


Fig. 2: Final Circuit Design

Part	Cost	Weight
Transformer	\$2.90	0.340 g
Current Sensor	\$3.79	0.077 g
Gate Driver	\$2.74	0.785 g
MOSFET	\$1.80	2.240 g
Diode	\$0.10	0.245 g
Total	\$11.33	3.687 g

VALIDATION

- Use cow ear to determine impedance and optimal frequency
- Weigh finished circuit to ensure it's less than 15 grams
- Test for feedback on successful shock delivery through current sensor feedback
- Test variability of shock using oscilloscope and ammeter

CONCLUSIONS & RECOMMENDATIONS

- Use an ideal frequency of 1000 Hz
- Use in vivo probes to allow minimal resistance
- Integrate shock circuit into current design
- Test on live cows to find ideal shock values

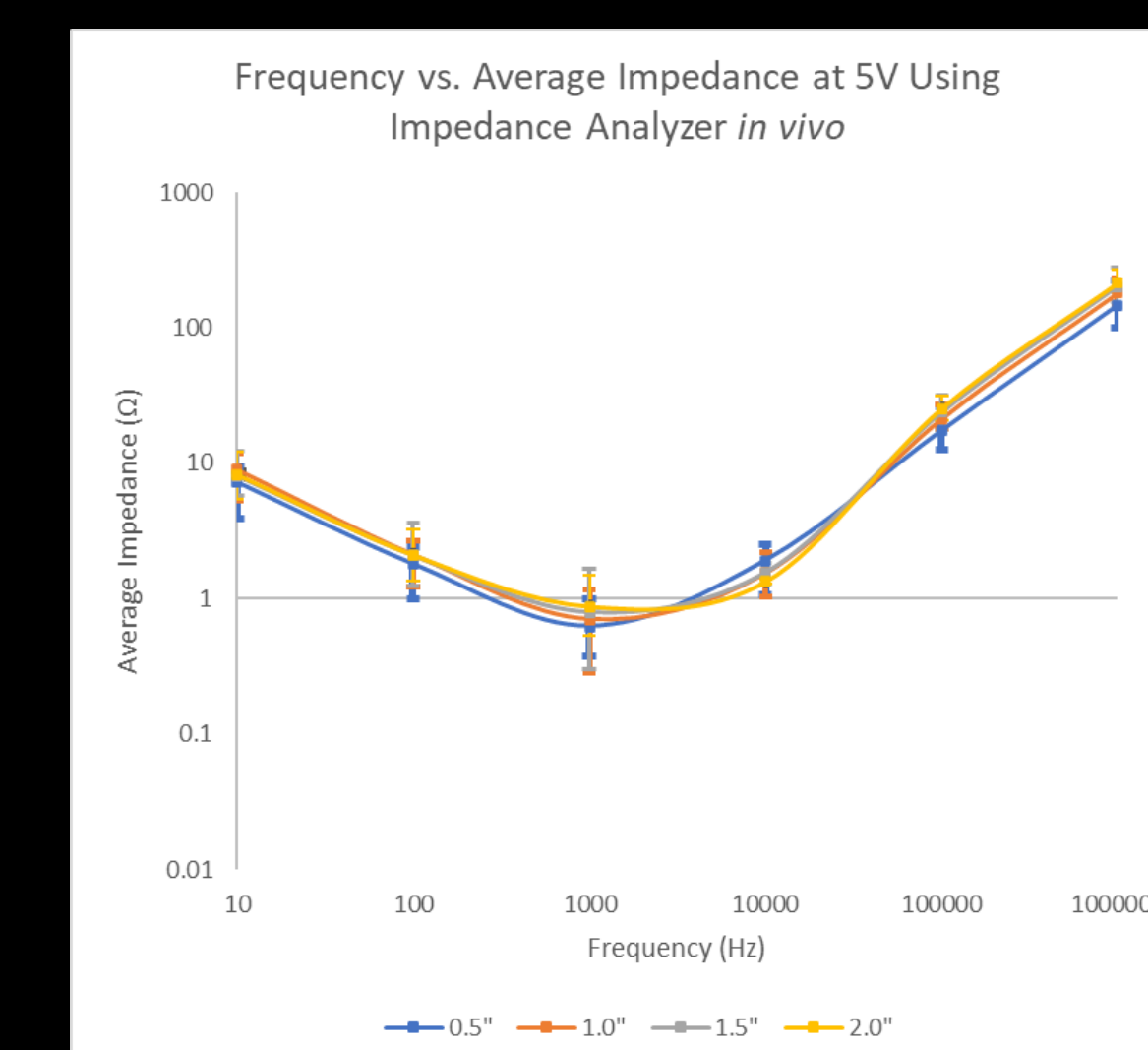


Fig. 3: Ear Testing Results

ACKNOWLEDGEMENTS

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