

## Final Project Proposal

**Year: 2024   Semester: Spring   Team: 12**  
**Creation Date: 1/10/2024**

**Project: Microphone Interface**  
**Last Modified: 2/6/2024**

### **Team Members (#1 is Team Leader):**

**Member 1: Liam Roach**

**Email: leroach@purdue.edu**

**Member 2: Jakub Kowalski**

**Email: kowals14@purdue.edu**

**Member 3: Joshua Hom**

**Email: hom2@purdue.edu**

**Member 4: Shubo Xie**

**Email: xie347@purdue.edu**

### **1.0 Project Description:**

Microphone Interface is a microphone interface intended to be used with analog microphones. This interface would receive the input from the microphone, and perform various kinds of DSP to the signal using a microcontroller, with additional physical inputs in the form of knobs in order to adjust any of their parameters. This would allow the user to fine tune various effects which they would like to apply in order to adapt to their relevant environment, microphone, as well as intended sound they would like to achieve. The interface will also contain UI on an LCD screen in order to help the user navigate the different effects and visualize the changes being applied to the signal, allowing the process to be more intuitive for users. The interface would be connected through an audio connector to a computer as its output, from which it would also receive its power from.

### **2.0 Team Member Expertise and Team Roles and Responsibilities:**

#### **2.1 Team Member Expertise:**

##### **2.1.1 Team Member: Jakub Kowalski**

Jakub Kowalski has experience working with software for embedded systems and simple applications through his coursework and small personal projects. As a member of Purdue's Autonomous Robotics Club he has been exposed to working with a larger codebase and coordinating with multiple subteams. He has foundational knowledge of DSP from introductory courses, and as a hobbyist in music production has been exposed to how DSP is implemented in commercial software. His interest in the development of DSP algorithms, as well as his project experience make him suitable for the role of software lead.

##### **2.1.2 Team Member: Liam Roach**

Liam Roach is well versed in C, C++, and Assembly from taking courses and working on hobby projects. Additionally he has taken classes pertaining to digital systems, embedded systems, software engineering, and computer graphics. In his free time he has dabbled with music production and gained a general understanding of related technologies. He has also done several internships where he worked with teams of professional software engineers and IT experts alike. Due to his software engineering experience and experience with working with professional teams, he will be the team lead.

### 2.1.3 Team Member: Shubo Xie

Shubo Xie has experience with analog circuit design during internship projects of design power supply circuit boards. Also, he has done digital circuit design of the USB receiver part in the ASIC lab. Besides designing integrated circuits, he contributes to the Computer Vision for Embedded System team by improving the model of efficient transformers. Thus, Shubo will be a good choice to be the hardware lead in the team, responsible for configuring the project's power regulation and hardware connections.

### 2.1.4 Team Member: Joshua Hom

Joshua Hom has experience of designing systems through projects from coursework. He has designed a functional processor in Verilog which pertains to creating RTL diagrams, protocols and testbenches. He also has experience in embedded systems, working with sensors, sending, and receiving data to and from servers. Finally, he has experience with data structures in C and C++. With all this considered, Joshua makes a good candidate in being the systems lead for this project.

## 2.2 Team Roles and Responsibilities:

Role	Team Member
Team Lead	Liam Roach
Systems Lead	Joshua Hom
Hardware Lead	Shubo Xie
Software Lead	Jakub Kowalski

## 3.0 Homework Assignment Responsibilities

Below are the assigned homework responsibilities

<i>Design Component Report</i>		<i>Professional Component Report</i>	
A3-Software Overview	JK	A9-Legal Analysis	JH
A4-Electrical Overview	SX	A10-Reliability and Safety Analysis	JK
A6-Mechanical Overview	JH	A11-Ethical/Environmental Analysis	SX
A8-Software Formalization	LR	A12-User Manual	LR

LR: Liam Roach    JK: Jakub Kowalski    JH: Joshua Hom    SX: Shubo Xie

**4.0**

<b>Item</b>	<b>Estimated Price</b>
<b>Mechanical</b>	
Packaging	\$50.00
<b>Electrical</b>	
Knobs	\$10.00
Buttons	\$6.00
Digital Signal Controller	\$30.00
Circuit Board Components	\$40.00
Circuit Board Fabrication	\$50.00
LCD Screen	\$35.00
USB Cables	\$10.00
<b>Other</b>	
Shipping Costs	\$60.00
<b>Total:</b>	\$291.00

**Estimated Budget**

Below is the estimated budget for the project.

## **5.0 Project Specific Design Requirements**

Below are the criteria necessary to the success of our project.

1. An ability to receive power from a connected USB host device which will also serve as the destination of the audio output.
2. An ability to perform DSP effects such as EQ, compression, and delay on input audio.
3. An ability to control DSP parameters using input from a set of rotary encoders and buttons.
4. An ability for the microcontroller to interface with an LCD display via HDMI.
5. An ability to provide a graphical user interface displaying the state of current DSP parameters.

## **6.0 Sources Cited:**

No external works were used to write this report.