



LEDshred

Preliminary Design Presentation Team 5 ECE 415 SDP 2021

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The Team



Jordy Mukania Electrical Engineer Team Coordinator

Isaiah Provencher Electrical Engineer Altium Lead Jake Colapietro Computer Engineer Budget Management Kivan Daruwalla Computer Engineer

Motivation

- Difficult to learn new instruments and songs on own
- Lessons tend to be very expensive
- Early complications lead to frustration and quitting



Figure 1: Guitarist showing student how to properly hold strings

Problem Statement

Many people are eager to learn new instruments and songs but are easily deterred as soon as they run into difficulties. Our product, designed for beginners will use light mechanisms on the fretboard of guitars to guide the user and will then offer feedback on their performance. We are hoping that after the use of our product, users will be able to play proficiently without the use of any guides.

Current Solutions

Rocksmith

- No visuals on guitar for users
- Tedious having to constantly look at videos and compare with self



Figure 2: Rocksmith video game

Current Solutions (continued)

Self paced Apps

- No physical instrument component
- No visuals on guitar for users
- Tedious having to constantly look at videos and compare with self
- No feedback on performance



Figure 3: Yousician instrument teaching app

Visual Representation of Our Proposal



Figure 4: App Companion controlling LEDs and reporting user performance Figure 5: Array of LED lights across six strings to guide user

Figure 6: Feedback on user performance

System Specification

- LED lights attachable to any guitar (Typical 38 inch long)
- 5 X 6 array of LEDs (5 rows with 6 LEDs across each strings)
- Height of LEDs across strings < 2.5 mm
- Accompanied by app which supports bluetooth connectivity to user device
- Correctly distinguishes a note > 95%
- User interface will have performance report
- User report available in < 5 seconds (after play session is finished)

Preliminary System Block Diagram





Hardware Components

- Microphone
 - Needs to accurately capture guitar notes
 - Guitar sounds frequencies between 80Hz and 1,200Hz
- LEDs
 - Individually controllable
 - Color coded
 - Fit beneath strings without disturbing play
- Microcontroller
 - Perform preliminary digital signal processing on input signals
 - Must be compatible with the LED lights and Bluetooth Module
 - Communication to and from companion app

Significant Custom Hardware Solution

- Attachable PCB for LED light array
- Embedded with bluetooth and microphone
- Able to communicate with app
 - Receives data for LEDs
 - Transmits note played
- DC power supply



Figure 7: PCB Visual

Proposed MDR Deliverables

- Individual control over 2X6 matrix of LEDs (12 LEDs)
- Ability to convert sound picked up by microphone into digital signal to be used by microcontroller
- Ability to correctly identify individual notes > 80% of the time
- Fully functioning connection between Application and Cloud Service

Budget

Item	Quantity	Cost
Microphone - AOM-5024L-HD-R	1	\$3.16
Microcontroller - STM32F407VGT6	1	\$19.50
Bluetooth Module - HC 05 bluetooth	module 1	\$10.00
LED Lights - WS2812B LED Strip	1	\$36.99
Power Supply- PSA-10F-050	1	\$12.56
Estimated PCB cost	1	~\$20
Guitar	2	~\$80

Total Cost: \$182.21

Project Management Gantt Chart

A	В	C	D	E	F	G	н	1	J	К
Week of	Sep 28	Oct 5	Oct 12	Oct 19	Oct 26	Nov 2	Nov 9	Nov 16	9.	Legend
Order necessary parts										Jordy
Install needed software										Isaiah
LED circuit development										Jake
Microphone & ADC circuit development										Kivan
Begin app UI										All
Configuration of MCU										
MCU preliminary testing on LEDs & ADC										
AWS set up										
App communication with AWS										
Full control over LEDs				1						
MCU identifies and process signals from microphone										
Gap week (in case of probems)										
MDR prep										
MDR Presentation										

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Thank you

Questions?