

Final Project Proposal

**Year: 2014 Semester: Fall
Creation Date: August 27, 2014**

Team: 9

**Project: DigiRocker
Last Modified: August 29, 2014**

Team Members (#1 is Team Leader):

Member 1: Tom Keen

Email: tkeen@purdue.edu

Member 2: Andrew Green

Email: green56@purdue.edu

Member 3: Betsy Grubbs

Email: egrubbs@purdue.edu

Member 4: Jacob Minnis

Email: jminnis@purdue.edu

1.0 Project Description:

DigiRocker is an enhanced electric guitar that facilitates learning and performance. LEDs on the fret board illuminate throughout a song in accordance with tablature loaded onto the system. The practice mode detects when the user plays the correct note, while the recording mode generates tablature based on the notes played. The guitar also features a user-friendly interface for adding common effects to the audio signal and emulating the sounds of other instruments.

2.0 Roles and Responsibilities:

Tom Keen has almost always been the leader in his project groups throughout his academic career, and groups led by him have always been successful. He draws on his experience of being a FIRST robotics team co-leader during high school and also as an associate at Delphi Automotive where he helped manage and train other students to write scripts for PCB design rule checking. He has a wide range of experience in ECE topics, from motor control to hardware description languages, making him well-suited to coordinating people with different skillsets.

Andrew Green has had experience with system design and software integration during internship projects at Raytheon and Cisco. In addition, he has significant interest in signal processing. For these reasons, Andrew will be the systems engineer for the team, responsible for investigating audio processing techniques and for ensuring the coherent interface of project components.

Betsy Grubbs has significant experience in digital and analog circuit design including the design of a 16-bit adder from the transistor level. She also has extensive knowledge of semiconductors, lasers, optics, and current semiconductor fabrication processes as well as significant experience in Cadence Virtuoso (analog and digital schematics and layout). She is also in ECE 557 and therefore has access to the clean room and fabrication lab. This will allow the team to design custom electronics if so desired. Betsy has been designated the Hardware Engineer since she has taken classes focusing on digital and analog integrated circuits as well as several software classes. This will allow the team to make appropriate and efficient decisions regarding the selection of components due to software capability requirements.

Jacob Minnis has experience coding, particularly at a low level, from both computer engineering courses and summer internships. He also prefers to code in C and is taking the Embedded Systems course, which makes him well-suited for the role of software engineer for the project.

2.1 Homework Assignment Responsibilities

Below are the assigned homework responsibilities (Figure 1).

<i>Design Component Homework</i>		<i>Professional Component Homework</i>	
3-Electrical Overview	Betsy	9-Legal Analysis	Andrew
4-Software Overview	Andrew	10-Reliability and Safety Analysis	Betsy
7-Mechanical Overview	Tom	11-Ethical/Environmental Analysis	Jacob
8-Software Formalization	Jacob	12-User Manual	Tom

Figure 1: Assigned Homework Responsibilities

3.0 Estimated Budget

Below is the estimated budget for the project.

Item	Estimated Price
<i>Mechanical</i>	
Cheap, used guitar	\$100.00
Nickel guitar strings	\$5.00
Extra packaging	\$50.00
<i>Electrical</i>	
Digital signal controller	\$20.00
SRAM/Flash	\$10.00
Circuit board components	\$30.00
Circuit board fabrication	\$50.00
LEDs	\$20.00
LCD	\$40.00
Touch Screen Overlay	\$50.00
Cables	\$25.00
Rechargeable Batteries	\$30.00
<i>Other</i>	
Shipping	\$50.00
Total:	\$480.00

Figure 2: Estimated Component Prices

Mechanical items include the non-electrical components of the project such as packaging. These components are less likely to be damaged in the development process, and as such will not likely need to be replaced.

The next section is Electrical items. Electrical items are components that will in some way be electrically connected to the circuit board, and as such run the risk of being damaged at some point throughout the development process. These may have to be purchased multiple times, so keeping costs low in this section is a priority.

Finally, there are other items that aren't necessarily physical products, but rather services such as shipping.

The distribution of the costs for the project has not yet been determined, since some goods may be provided by team members. However, it is assumed that all group members will contribute a reasonable amount of around \$120 towards project costs.

4.0 Project Specific Success Criteria

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

1. An ability to light up LEDs on the fret board as a guide for the guitar player so that he or she may play along with a song.
2. An ability to modulate the guitar's analog output with at least three guitar effects.
3. An ability to load the tablature for at least one song onto the guitar's memory.
4. An ability to synthesize waveforms with a frequency that corresponds to the note played.
5. An ability to record the tablature of songs played by the user.

5.0 Sources Cited:

No external works were used to write this report.