Department of Electrical and Computer Engineering

ECE 445

Senior Design Project Proposal

Electric Air Guitar

Written by:

Ivan Setiawan (setiawa2)

&

Satyo Iswara (iswara2)

TA: Jane Tu

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1. Introduction

1.1 Title and Motivation

Our project is about the Electric Air Guitar. We are interested in this project because of our interests toward music. Also, we think that the electric guitar can be expensive. Since an electric guitar can cost above $200, we want to create a pair of glove which will have functionality like an electric guitar. So, our idea of an electric air guitar can greatly reduce the cost of the electric guitar. Thus, people who want to learn how to play an electric guitar do not spend too much money to buy this instrument.

1.2 Objective

Our objective with this project is that we will use a pair of gloves to play an instrumental music. The left hand glove has metal plates which have functionalities like buttons. And, the combinations of button pressed will be sent through the antenna to the right hand glove to interpret the buttons' combinations. Also, the distance between the hand gloves can also determine the chords being played. A program will be implemented into the microcontroller in order to generate the sound and to decode the buttons' combinations. Then, by connecting the microcontroller to the sound generator such as speaker, the sound can be produced.

1.3 Benefits

- Encourage people to learn how to play an electric guitar since our instrument will cost at cheaper price than the electric guitar in the market
- Simplify the music playing since the chords are detected by how far the distance between each glove is
- Easy to carry and transport due to the compactness of the devices

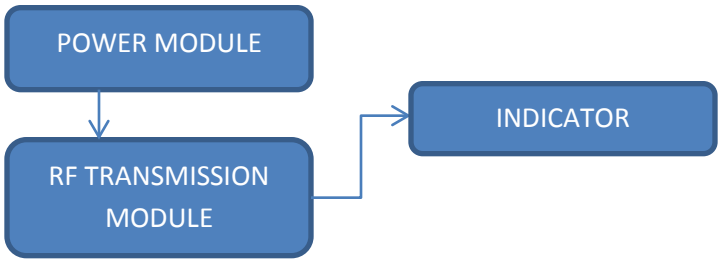
1.4 Features

- The seven segment display will show what chords' combinations are currently played
- One octave range note (from key C and go back again to key C) can be played
- The microcontroller will interface with the gloves and the speaker to decode and generate the chords

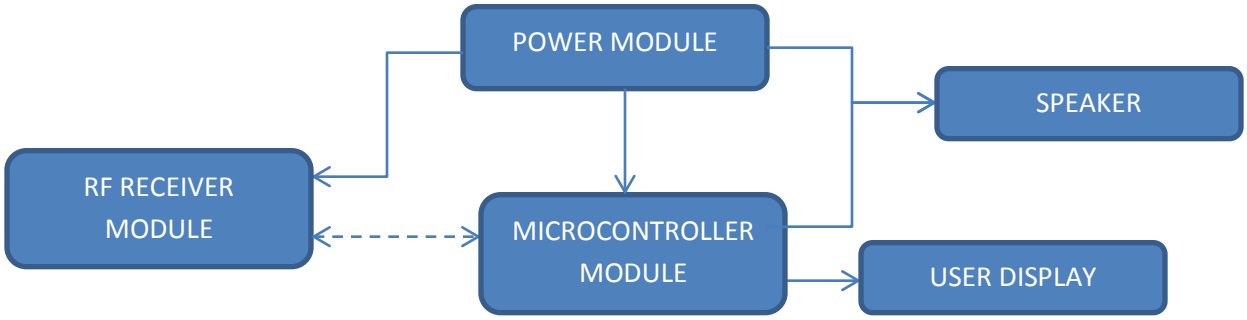
Designs

2.1 Block Diagram

Left Hand Glove



Right Hand Glove



2.2 Block Descriptions

Power module: The power module is the AC power source (6 volt). This is mainly used as power source for all other components in the design. We use batteries for our design to improve the mobility.

RF transmission module: Radio frequency generator circuit and antenna. This circuit and antenna are mainly responsible for transmitting radio frequency.

RF receiver module: Radio frequency receiver circuit and antenna. This circuit and antenna are responsible for receiving the radio frequency that being sent by transmission module then sends feedback to microcontroller module.

Indicator: LED display on/off. This is useful for user to know whether the transmission module working or not.

Microcontroller module: We use Arduino programmable microcontroller for this project. This is where the signal gained from the receiver is decoded. The microcontroller is mainly used to determine certain

signals that are being played at certain note. The microcontroller then sends signal to speaker in order to play specific note.

User display: HEX driver and LED are used to indicate the users which note is currently being played.

Speaker: The speaker is useful to generate specific note at certain frequency.

2.3 Performance Requirements

1. Successfully determine the chords based on the distance between each glove (at most three feet)
2. Plays the right range of frequency i.e C_4= 261.63 Hz to C_5 = 523.25 Hz
3. Able to generate 1 Watts of power for speaker purpose

2.4 Special Circuit

Special circuit is not needed for this project.

3. Verifications

3.1 Testing Procedures

One of the important testing procedures in our project is to ensure the signal can be transmitted properly from the transmitter from the left hand glove. After the transmitter can transmit a signal, the next testing procedure is to test the right hand glove whether it can receive the transmitted signal or not. The next test will ensure that the transmitter and the receiver can still work if the distances and the angles between them vary. This testing procedure is very important in the design because the devices will determine the chords based on the distance.

After the data can be transmitted and received, we need to check and debug the microcontroller used to decode the signal transmitted from the left hand glove. Since the microcontroller will ensure that the sounds and the chords can be produced properly, accurate and thorough testing is critical.

Finally, we will assemble each of the individual components for debugging purposes. If the devices can generate different combinations of chords based on the distances, then the project is successful.

3.2 Tolerance Analysis

The most important part in our project is to determine the combinations of chords that are being played depending on the distance between the two gloves. In addition to that, the antenna must be able to generate the frequency of the chords being played at the specific distance. Those tests are important for this project because if the frequency cannot be generated properly, then the sound would be incorrect. One way of doing this is by placing our wave generator (i.e speaker) next to a guitar tuner detector, which would detect specific note.

4. Cost and Schedule

4.1 Cost Analysis

Parts

Parts	Quantity	Price	Total Cost
A pair of gloves	1	$10	$10
Speaker	1	$10	$10
Transmitter	1	$20	$20
Receiver	1	$20	$20
LED	4	$0.15	$0.60
Battery	4	$2.50	$10
Arduino Microcontroller	2	$30	$60
Total			$130.60

Labors

Name	Rate	Bill Hours	Total = Rate x 2.5 x Bill Hours
Ivan Setiawan	$40 / hr	200	$20,000
Satyo Iswara	$40 / hr	200	$20,000
Total Labor Cost			$40,000

Total cost of production = $ 40,130.60

4.2 Schedule

Date	Tasks	Member
6-Feb	RFA proposal due, TA meeting	All
	Doing research of how to determine the chords by calculating the distance	Satyo
	Doing the research about the materials needed	Ivan
13-Feb	Research and design about RF transceiver / transmitter	Ivan
	Resarch and design about the microcontroller	Satyo
	Review and consult the design to the TA	All
20-Feb	Ordering parts	Satyo
	Design review final	All
27-Feb	Build RF transmitter prototype module	Ivan
	Build RF receiver prototype module	Satyo

	Build power module	Satyo
5-Mar	Testing the transmitter and the receiver	Ivan
	Microcontroller coding for decoding the chords played	Satyo
	Debugging and testing each module	Ivan
12-Mar	Work on the interface between RF antenna with the microcontroller	Ivan
	Work on the interface between microcontroller with the speaker	Satyo
	Testing the transmission range between each glove	Satyo
19-Mar	Spring Break	All
26-Mar	Preparation for mock up demo and presentation	All
	Assemble all of the parts and debugging each components	Satyo
	Testing the transmission range between each glove	Ivan
2-Apr	Mock up presentation	All
	Debugging, Checking each components	Ivan
	Debugging and testing the whole system	Satyo
9-Apr	Tolerance error analysis	Ivan
	Testing and debugging the whole system for final demonstration	Satyo
16-Apr	Preparation for final demonstaration	All
23-Apr	Demo / Presentation	All
30-Apr	Demo / Presentation / Checkout	All