
The Guitar Chord Learning System

Calvin A. Sessions

Senior Project Proposal

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Western Washington University

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ETEC 471, Professor Morton

Introduction

The ability to utilize a six stringed instrument as a medium to express soul, energy, and internal emotions has given individuals the desire to learn how to play the guitar. This instrument, however, is generally difficult to learn and a daunting task to teach. Beginners often become discouraged and lose interest after battling the frustration of learning basic guitar chord positions.

I propose to develop a system that will eliminate this displeasure. The Guitar Chord Learning System (GCLS) will be an educational tool designed to teach individuals basic guitar chord positioning techniques. This system will eliminate the hassle of using chord positioning look-up tables and give the user an opportunity to acquire guitar playing skills while supplementing or even replacing traditional one-on-one guitar lessons.

Chord progression patterns from a song would be typed into a user interface on a PC and downloaded into the GCLS. The GCLS would then output the proper finger positions utilizing a matrix of LEDs embedded into the fretboard. A foot switch would change the chord position output with respect to the downloaded chord progression. This system will give the user the ability to learn any desired song by obtaining chord progression sequences from the internet. Because the GCLS can be used as a form of independent learning, the user will be able to grasp and improve guitar chord skills at his/her pace.

Description

As displayed in Figure 1, The Guitar Chord Learning System will be controlled by a Motorola MC9S12DP256 microcontroller. A computer program that communicates with the microcontroller via a serial port will enable the user to input chord progression sequences of a song and store them into three different GCLS channels. Depending on the user's preference, each channel could be designated to store sequence information such as the chord progression of the verse, chorus, and bridge. The channels could also be used to store sequences for three separate songs. After this information is downloaded into the microcontroller, the GCLS could be disconnected from computer and used as a stand-alone system. A user would be given the freedom to practice in any desired location with this feature.

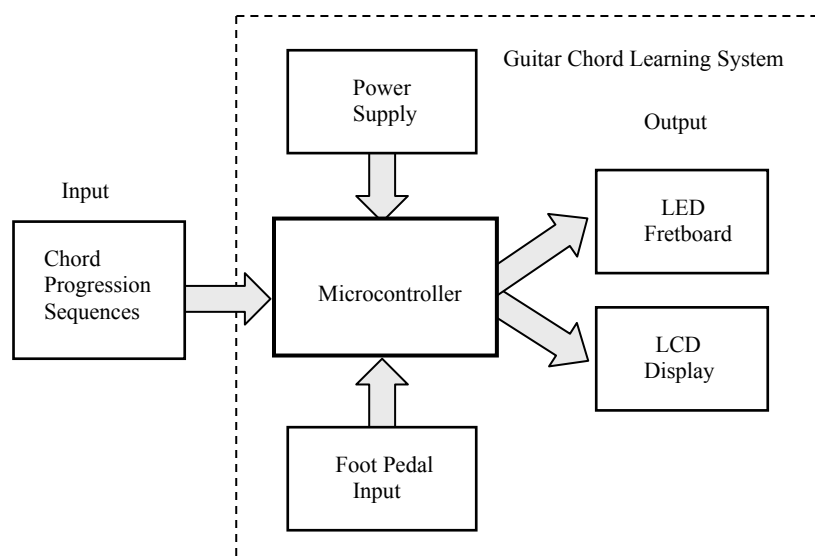


Figure 1: GCLS Block Diagram

The actual fingering position with respect to the present chord in the sequence would be displayed on the fretboard of the guitar. As shown in Figure 2, the guitar would have 24 LEDs embedded into the fretboard. Each LED would represent the finger position corresponding with the string and fret, thus forming a 4 by 6 matrix. This matrix was chosen because all of the basic chord positions can be found within the first four frets on the guitar neck. The proper LEDs would activate according to the present chord in the sequence, displaying a visual representation of the correct finger positions.

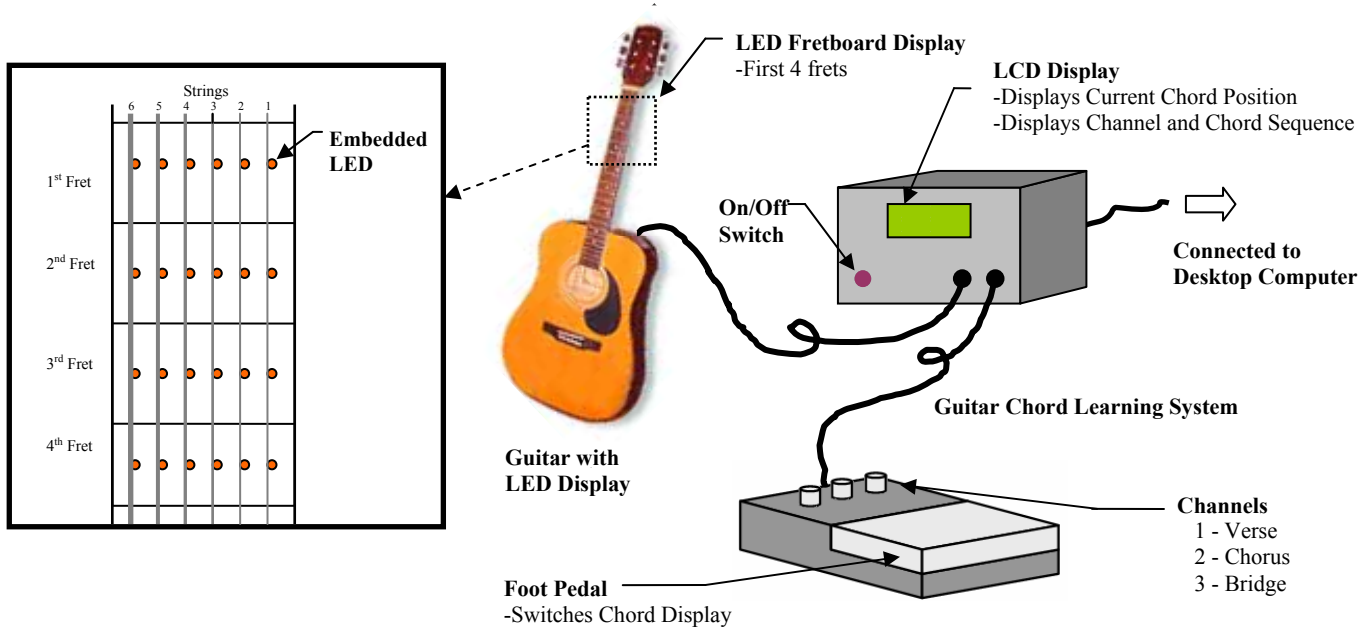


Figure 2: GCLS Product Sketch

The chord position output would change when the user depresses the foot pedal, as represented in Figure 1. Three buttons on the foot pedal, as displayed in Figure 2, will control the present channel output. With this, the user would be able to follow along with a song or sheet of chords downloaded off of the internet and depress the foot pedal in correspondence to each chord change.

An LCD display, as shown in Figure 2, would be utilized to enhance the performance of the GCLS as a learning tool. The display will output the present channel selected and present chord name. The GCLS will have its own power supply.

Benefits

The Guitar Chord Learning System would teach the user proper finger chord positions directly without the aid of an instructor or table of chords.

Guitar lessons from instructors offered at Music shops is an expensive investment, requiring weekly sessions for at least \$40 a month.

As an educational tool, this system is targeted towards children and adults who wish to play the guitar. With this said, the GCLS would be suitable in an academic environment, such as music programs in middle schools, high schools, or colleges. Music shops that provide guitar lessons can also rent this system out to eager beginners to supplement or even replace one-on-one beginner lessons.

In addition, the GCLS gives the user freedom to learn any desired song. Because becoming an excellent guitarist does not require the ability to read musical notes, like with the piano, it is easy to obtain chord progression sequences via the internet. Several websites are devoted to providing guitar chords, including the latest songs transcribed in popular culture. The user can easily utilize the internet to obtain chord sequences to download into the Guitar Chord Learning System.

Comparison

Though the Guitar Chord Learning System is an original design, I discovered that a similar product has already been developed. This validates that my design is both useful and marketable.

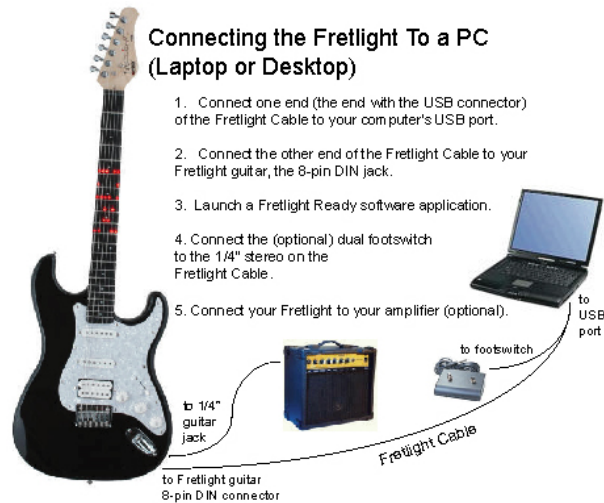


Figure 3: Optek Music Systems Advertisement

Optek Music Systems (<http://www.optekmusic.com>) has recently developed the Fretlight Guitar. According to their website, the guitar plugs into a PC or laptop directly via USB port with an optional footswitch. The Fretlight guitar has LEDs for all note positions on the fretboard and is controlled by Fretlight Ready software applications. This system is targeted towards beginners to advanced professional guitarists and teaches chords, progressions, scales, and riffs. These specialized guitars cost \$599.95 and \$349.95 for a retrofit Fretlight neck.

The Guitar Chord Learning System design, though, focuses on teaching beginning guitar students, utilizing only the first four frets of the guitar. Unlike the Fretlight, the GCLS design will also be a stand alone product with three storage channels, allowing the user to practice in a desired location. The ability to learn any song found on the internet and download the chord progression patterns is also a function not found in the Fretlight product. Though both designs use the same method of displaying fingering positions, different approaches for learning how to play the guitar are presented.

Development

Because Western Washington University's Electronics Engineering Technology program utilizes Motorola MC9S12DP256 microcontrollers in the Embedded Systems course, the MC9S12DP256 will be implemented into my design. During software development, 108 chord positions will be programmed into the microcontroller to control the embedded fretboard LEDs. As mentioned earlier, a user interface program to input chord sequences would also have to be developed. All electronic hardware and software development will take place in the Electronics Engineering Technology laboratory facilities.

The most time-consuming task in this project is the development of the fretboard with embedded LEDs. After searching on the web, I found an excellent website that displays a technique for drilling holes in a fretboard and installing LEDs for aesthetic purposes:

http://www.home.earthlink.net/~ds_quinn/webpages/LEDinstall.htm).

An old guitar will be utilized for construction following the website's installation techniques. To save time, I plan on accomplishing this task during winter break so that I can focus completely on research and development of the GCLS.

Demonstration

A day at the end of Spring Quarter is designated for senior project demonstrations. During the demonstrations, I envision asking an audience member for a favorite song. The song chords will be searched quickly on the internet and typed into the computer user interface. The chord progression will then be downloaded into the Guitar Chord Learning System. Using the GCLS, the audience member will play the guitar while following the lyrics to the song.