

Guided Guitar Learning and Playing Assistance Device

Wiktoria Rozkosz

Concept

The device is designed to facilitate the way people learn and play the guitar by automating the learning process and providing real-time guidance during practice. It will consist of two primary functions:

- **Learning Mode:** In this mode, the device will guide the user through chord progressions and finger placements by illuminating the buttons or diodes that correspond to the correct frets to press. This will allow the user to visually and interactively learn how to play chords and melodies.
- **Self-Playing Mode:** In this mode, the device will autonomously play chords and melodies by both strumming and plucking the strings and pressing the correct frets. This allows the user to see how a song should be played and even play along with it.

Additionally, the device can pluck individual strings or strum chords based on the song being learned, providing assistance with both melody and rhythm. This combination will help not only beginners, but also advanced players by automating difficult tasks like pressing the correct frets and strumming, as well as providing visual and physical guidance for learning complex chords and songs.

Technical Overview

Mounting and Integration

- **Guitar Integration:** The device will be attached to the guitar, mounted near the neck and bridge for playing assistance. The system will be non-invasive and easily removable to ensure compatibility with many guitar models.
- **LEDs and Buttons:** The device will include LEDs or illuminated buttons that will light up to indicate which frets to press for playing specific chords or notes.

Guided Learning System

- **Real-time Chord and Note Guidance:** The core feature of the device is its ability to illuminate the correct buttons or diodes on the fretboard, showing the user exactly where to place their fingers to play a chord or melody.
- **Audio Feedback and Chord Detection:** The device will include a microphone that listens to the sound of the guitar and determines whether the correct chord or note has been played. Based on the sound, the device will then guide the user to the next chord or note in a song.
- **Progressive Learning Mode:** As the player improves, the system can gradually increase the difficulty by introducing more complex chords and songs.

String Plucking and Strumming Mechanism

- **Plucking System:** A system will be placed above the strings near the sound hole or bridge of the guitar. It will consist of a series of small mechanical pick holders that can pluck individual strings.
- **Strumming System:** For chord strumming, the device will utilize a linear motion to quickly strum all strings, similar to a human player's action. The strumming pattern will be programmable and can match the rhythm of a song being learned or played.
- **Fret Pressing System:** The device will feature small mechanisms positioned over the fretboard. These actuators will press down on the strings at specific frets based on the chord or note being played. The system will be fast and accurate enough to switch between chords and notes in real time, enabling the device to play songs autonomously or assist the user by pressing the correct frets for them to pluck.

User Experience

- **Beginners:** For those just learning how to play the guitar, the device will be an invaluable tool. It will visually guide them through chord progressions, correct finger placements, and strumming patterns, making it easier to learn basic songs without frustration. Beginners could, for example, profit from just focusing on the strumming patterns or chords.
- **Intermediate Players:** Intermediate players can use the device to explore more advanced chord progressions or scales. The real-time feedback and guidance will allow them to improve their technique and accuracy.
- **Advanced Musicians:** Advanced users can benefit from using the device as a practice tool to test out new songs, chords, or compositions, and receive feedback on their accuracy and timing.

Risks

- **Latency in String Plucking or Fret Pressing:** For the device to guide and respond in real-time, it must be very well calibrated to avoid delays in lighting up the correct buttons or detecting the played chords.
- **Complex installation:** Attaching the device to different guitar models may be challenging, especially if the mounting system is too complicated.
- **Sensor Accuracy:** The effectiveness of the audio feedback system depends heavily on the accuracy of the microphone in detecting chords or notes. Any inaccuracies could misguide the user.

Research on Related Projects

Several projects exist that aim to simplify guitar learning through visual aids and physical assistance. For instance, the *Fret Zealot* uses LED lights on the fretboard to indicate where fingers should be placed, helping users learn chords and scales visually. Another popular tool, the *ChordBuddy*, assists beginners by providing a physical attachment that simplifies pressing down the strings for basic chords, reducing the difficulty of finger positioning. This device, available on platforms like Amazon, is focused primarily on chord learning, but lacks the flexibility for advanced techniques or automated progression.

While these devices help with chord recognition and finger placement, they do not offer features like automated plucking, strumming, or real-time audio feedback. The proposed device aims to integrate these functionalities. In addition, the use of diodes to light up the correct frets, combined with an automated system to assist with string pressing and plucking, offers a more comprehensive learning experience than existing solutions.

For further references see:

- [ChordBuddy](#)
- [Fret Zealot](#)
- [Demonstration Plucking and Strumming System](#)
- [Other examples](#)

Project Summary

This project will improve upon existing technologies by combining real-time audio feedback, automatic chord progression guidance, and strumming/plucking automation into one system.

Future Opportunities

- **Automatic Tuning System:** In future versions, the device could incorporate an automatic tuning system. A microphone or piezo pickup would detect the frequency of each string, and small motors on the headstock could automatically adjust the tuning pegs for precise pitch correction. This feature could support multiple tuning modes, allowing users to switch between standard and alternate tunings, such as drop D, through a mobile app or onboard controls.
- **Real-time Lessons and Tutorials:** An interactive mode could be developed, where the device provides guided lessons that adapt to the player's skill level, offering feedback and tips to improve playing.
- **Expanding to Other Instruments:** The device's core technology could be adapted for other string instruments like violins or bass guitars, being valuable to a larger range of musicians.
- **App or Web-Based Learning Platform:** An accompanying app or website could be developed to allow users to select songs, adjust learning modes, or track their progress over time.

Draft

