

A Software-Based Pitch-Shifting Plugin for Modern Music Production

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The VST (Visual Studio Technology) and AU (Audio Units) plugin ecosystem greatly contributes to the music industry today. With the rise of digital audio workstations (DAWs) in the early 2000s, technology has become an integral part of music production and composition [2]. In particular, the electric guitar has long been associated with technological advancements in the industry. Engineers first harnessed the power of vacuum tubes to create the earliest electric guitar amplifiers, and later transitioned to transistor-based designs.

Today, traditional amps and effect pedals have been overtaken by virtual amplifiers and software-based effects plugins. Once-dominant traditional hardware companies are now competing with highly technical and lucrative software companies that specialize in music production software [2]. The purpose of this project is to design and implement a high-demand audio plugin for modern music production software.

The plugin in question is a pitch shifter, a widely used effect that digitally alters an input signal in real time. Its core functionality is to increase or decrease the input signal's pitch by algorithmically altering every frequency component in a signal [1]. More importantly, it allows for a guitar player to quickly change the tune of their guitar. This solves the common problem of a guitar player wanting to play a particular song in a certain tuning (typically a lower tuning) but their guitar does not support said tuning. Thus, the pitch shifter solves this problem by digitally modifying their guitar signal to their desired tuning before reaching their amp.

Although pitch-shifting effects already exist in both pedal and plugin form, their widespread use and high degree of customizability make this a worthwhile and technically meaningful project to pursue. The plugin will have a simple interface that abstracts much of the complicated logic and mathematics underneath. The program's GUI will be a dial that represents the semitone change the user desires. Additionally, a live view of the incoming signal will be displayed so that the user understands how exactly they are modifying their guitar signal.

When you use an image, such as in Figure 1, refer to it in the text.

Figure 1: Archie

Appendix

A concise list of features / user stories in the order in which they will be built. A few examples are below to demonstrate the expected scope and level of granularity; you will have more features than this.

- Default picture display on web application.
- On a button-click, user can separate the image into foreground and background.
- User can select a picture from their desktop.
- Selected picture displays on the web application.

References

- [1] RAI, A., AND BARKANA, B. D. Analysis of three pitch-shifting algorithms for different musical instruments. In *2019 IEEE Long Island Systems, Applications and Technology Conference (LISAT)* (2019), IEEE, pp. 1–6.
- [2] RANA, M. R. H. The influence of technology on modern music production. *International Journal of Humanities and Information Technology* 6, 04 (2024), 19–25.