Transforming music learning: Keroncong guitar VSTi prototype as a catalyst for educational innovation

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ABSTRACT

The rapid development of technology in music education requires music educators to be creative and critical in developing technology-based learning tools. This ensures that learning aligns with current trends and is implemented more effectively. In addition to enhancing learning, technology also addresses challenges faced by music composers. This study focuses on creating a Virtual Studio Technology Instrument (VSTi) for the keroncong guitar as a teaching aid. In keroncong music, the guitar plays a key role in improvising chord progressions, demanding specialized skills from musicians and composers. Using a practice-oriented approach, this study covers the pre-production, production, and post-production stages of developing a VSTi for the Keroncong guitar. The results show that the VSTi operates effectively in a Digital Audio Workstation (DAW), serving as a valuable learning tool and reference for keroncong guitar patterns. The assessment demonstrated significant improvements in sound quality and user satisfaction, with 90% of users approving. Integration with other instruments showed a 25% average improvement, while flexibility and ease of improvisation received positive feedback from 80% and 75% of users. To conclude, the prototype of the Keroncong Guitar VSTi can catalyze educational innovation.

INTRODUCTION

Keroncong music is an original Indonesian music that has developed since the 16th century. This music has reflected the identity and personality of the nation and has been translated internationally. In its revolution, keroncong music cannot be separated from the contribution of today's youth (Supiarza et al., 2018). Many have proposed this keroncong music as a world heritage (Alfian, 2013). Keroncong music, influenced by the contribution of young people, has developed significantly. At first, keroncong music had its own rules, but over time, the younger generation has expressed songs from the West that are played in the keroncong style. This change shows the special challenges faced by keroncong musicians, especially in the aspect of improvisation.

These challenges include the need to adapt new elements from various genres while maintaining keroncong identity, including the barriers that musicians often face in terms of improvisation. This study aims to develop a virtual keroncong guitar instrument to help musicians overcome these challenges while providing an effective learning medium for them. Instruments in

keroncong music generally include cak, cuk, cello, violin, flute, and guitar. In its development, keroncong music can also be said to be hybrid music where the concept of local and global culture through the adaptation of Western concepts is found in the aesthetics of keroncong music (Yulfita & Asril, 2023).

Keroncong guitar is one of the main highlights in the discussion of this study. The concept of guitar playing in keroncong music as explained by R. Agoes Sri Widjajadi in Kusumah (2021) is that the concept of playing the keroncong guitar is a series of melodies that go up and down from the chord description with a note value of 1/8 and 1/16 and is done improvisationally; thus, technically, it is necessary to have the ability to improvise with the guitar in keroncong music. In terms of style, the guitar plays as an accompaniment in improvisation by paying attention to the running chords. Therefore, the improvisation is not as free as imagined, but it follows the chord progression being played, hence, the notes played are chord improvisation called arpeggios. Improvising using musical instruments is often found in jazz music.

There are various principles in doing an improvisation. Improvisation skills need to be possessed by every musician who wants to do improvisation for various types of music (Hidayatullah, 2023; Kusuma & Karwati, 2024). One developed idea of keroncong music improvisation is adding a passing tone, which means adding one note before going to one of the notes on the chord that will be chromatically forward or backward. However, the skill of improvising is not possessed by every musician or music educator (Larsson & Georgii-Hemming, 2019). Therefore, the researchers felt challenged to transform the keroncong guitar playing pattern into a virtual instrument that can be used as a learning medium for keroncong guitar and can also be used as a virtual instrument that can help keroncong music composers who have limitations in playing keroncong guitar. The virtual instrument was designed through the operation of a Digital Audio Workstation (DAW).

According to Leider (2005), DAW is a software that functions to edit and memorize audio digitally. This software can also function as a sophisticated recording studio by using plug-ins and special software that can produce studio-quality sound through computerization. Furthermore, DAW does not only function to record music but also allows users to create a virtual musical instrument through a recording mechanism. It is also a real form of technological development in music and is often used by music composers in composing a composition in various genres (Reuter, 2022). This shows that there are great opportunities provided by DAW to create various musical compositions performed by music composers. In the world of music education, DAW is often used as a learning medium in digital music (Bennett, 2016; Chrisanto et al., 2021; López-Íñiguez & Bennett, 2021). The use of information technology has enabled individuals to learn music better (Cipta, 2021; Duncan, 2021; Malaschenko et al., 2020).

Paul Middleton and Steven Gurevitz in Frenki et al., (2018) stated that a virtual instrument is computer software that produces sound from a musical instrument called a Virtual Studio Technology Instrument (VSTi). Furthermore, VSTi is used as a substitute for the original musical instrument and to create a musical composition, so that the sound of the musical instrument is digitally used. Generally, it is played using a MIDI Controller. According to Ramdani & Sukmayadi (2023), the use of VSTi in music production can be a solution to the limited access of people to traditional musical instruments. Furthermore, productivity in limited space becomes an expression that can be explained through the role of technology in overcoming the situation. VSTi's ability to simulate playing musical instruments makes music production more effective. Thus, VSTi is one example of technological progress in music. This can be a solution for music composers who have limitations in producing music using musical instruments that are difficult to access. In this study, researchers used a DAW called Logic Pro to process audio using the Virtual Guitar Instrument that is available from Logic Pro. The audio recording that was done began by drawing the notation of the keroncong guitar playing using the piano-roll feature in the DAW. The notation that has been made is then exported into a file with the format .wav based on the notation pattern that has been grouped.

In accordance, the increasingly rapid development of technology in music arts education has implicitly instructed that educators need to be able to be creative in utilizing technology for music arts education. This needs to be done as an effort to provide the best experience for students (Cano et al., 2018; Portowitz et al., 2014; Wise et al., 2011). In line with that, Swanwick (2001) explains

that music technology, cultural heritage, and music arts education have a mutually influential relationship with each other. It is further explained that music technology influences how we inherit music and this shows how we influence the world of music arts education. Swanwick added that through technology in music arts education, it is possible to overcome the problem of poverty. Thus, music education should also consider technological developments in understanding and inheriting music from time to time. Pratama & Latifah (2023) argue that currently, individuals who work in the music field can produce music through various choices of music software such as Kontakt Library, DAW, and MIDI as a means of creating and learning music. However, over time, renewal and innovation need to be carried out to inherit, develop, and preserve every aspect that has value in the world of music arts education (García-Gil et al., 2022; Nart, 2016).

Based on the background issue, the researchers first conducted a comparative study of the research to be conducted with previous research to find gaps that could be used as new information in this study. A study by Pratama & Latifah (2023) developed a virtual drum instrument, highlighting the need for a tool that can preserve local culture-based music. Meanwhile, Gunawan (2023) discusses the development of a virtual jaipong drum instrument as an effective musical creativity tool to preserve and promote local music rooted in traditional culture. Furthermore, Frenki et al., (2018) explore the process of transforming audio from the Payokumbuah kecapi instrument into a virtual instrument. These three studies show that the keroncong guitar as a virtual instrument has not been widely developed. Thus, this study aims to build on previous work by developing a VSTi of the keroncong guitar. This initiative is expected to address the gap in the tools available for keroncong music education, as well as contribute to the development and preservation of keroncong music among the younger generation.

METHOD

This study is explained descriptively through a qualitative approach through practice-oriented research. According to Hendriyana (2021), this method can be used as a method of creating works that are part of artistic research. The purpose of artistic research is to produce a deeper understanding of the creative process, artwork, and personal experiences that underlie the creation of art (Budiawan & Martyastiadi, 2020). The steps taken in developing keroncong guitar VSTi are divided into three stages as follows in Figure 1:
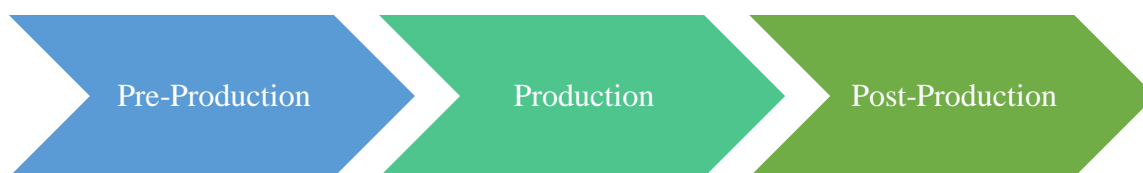

Figure 1. Development Stages of Keroncong Guitar VSTi

This methodology involves three stages: pre-production, production, and post-production. First, in the pre-production stage, an analysis of improvisation patterns in keroncong guitar playing, a review of relevant information, and a classification of various playing patterns to be designed were conducted. Second, in the production stage, a recording was conducted to create an audio sampling of keroncong guitar playing patterns using DAW, including placing audio samples in the Kontakt library, as well as scripting and designing the Kontakt GUI. Lastly, in the post-production stage, a trial of the VSTi that had been produced in a keroncong music arrangement using DAW was conducted. In general, this study focuses more on the pre-production and production stages. To validate the data, user feedbacks from educators and students were collected to ensure the effectiveness of this VSTi. This feedback was used as a success criterion in evaluating how well the VSTi functions as a learning and improvisation tool in keroncong music.

RESULTS AND DISCUSSION

Results

This sub-section presents the findings and discussion regarding the pre-production and production of the Keroncong guitar VSTi design:

Pre-Production

Based on the results of observations, various improvisation patterns were found in keroncong guitar playing. According to Kusumah (2021), the movement of the keroncong guitar playing is melody. The rules of the stepped tone movement, both semi and whole-tone, provide density between harmonic intervals. The improvisation technique used always relies on non-harmonic tones, which are melodic structures that use tones other than the ones that apply in the chord. After conducting observations, the researchers designed the two keroncong guitar playing patterns, namely ascending and descending, by playing chord arpeggios in 12 major and minor tonalities contained in staff notation, examples are below:

Figure 2. C Major Ascending Arpeggio Pattern using Passing Tones

Figure 3. C Minor Ascending Arpeggio Pattern using Passing Tones

Figure 4. C Major Descending Arpeggio Pattern using Passing Tones

Figure 5. C Minor Descending Arpeggio Pattern using Passing Tones

The figures above are patterns presented in the keroncong guitar VSTi developed by the researchers. The notes in red are passing tones or non-harmonic tones from the C major or C minor chord. As explained by Kusumah (2021), passing tones are non-harmonic tones that move in the same direction as the chord closest to the intended tone. The patterns used are divided into two, namely ascending, which means the melody moves from low to high notes, and descending, which means the melody moves from high to low notes. In the VSTi presented, these patterns are arranged in a system of 12 tonalities.

Production

The production stage was carried out to realize the research plan in making keroncong guitar VSTi by recording guitar playing patterns with notations that had been made in the pre-production stage. The recording process was carried out simply through DAW operation, without a conventional recording mechanism. The creation of this VSTi aims to create a keroncong guitar improvisation playing pattern, thus, the researchers recorded the guitar playing pattern through the guitar VSTi that

was available in DAW. In the first stage of production, the researchers entered the guitar VSTi available from the DAW and then created a new track, see Figure 6.
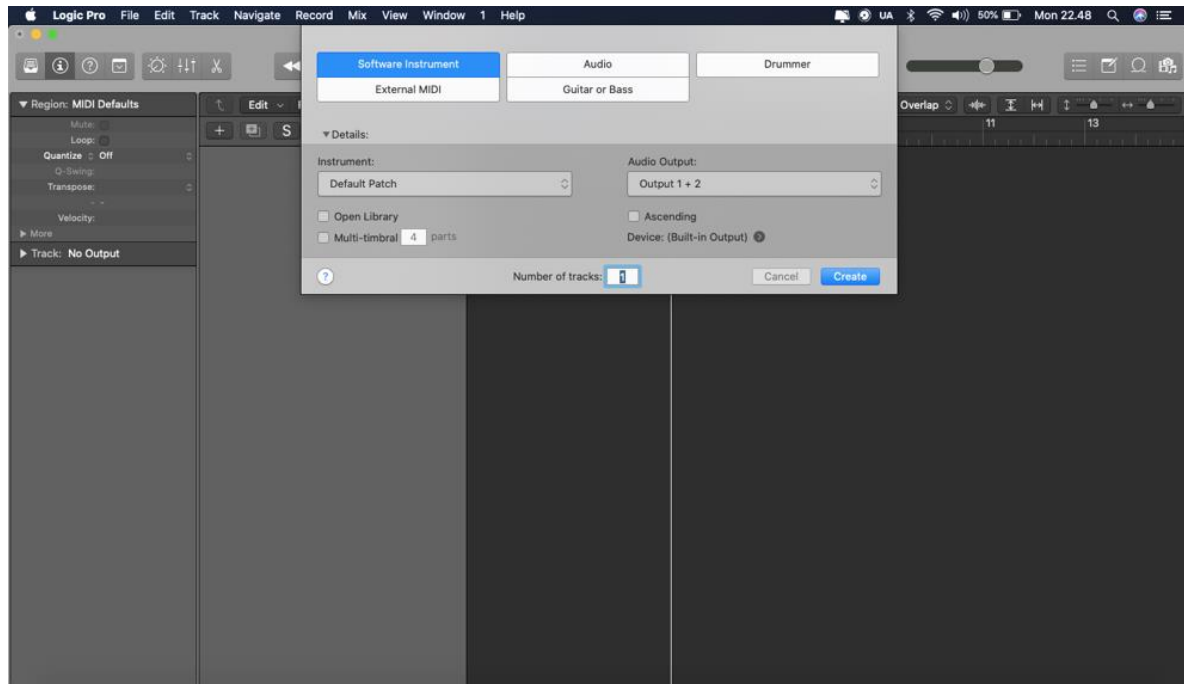

Figure 6. Initial View when Opening Logic Pro DAW

At this stage, the researchers created a new track by paying attention to the instrument source and output channel used to create the keroncong guitar VSTi improvisation pattern.
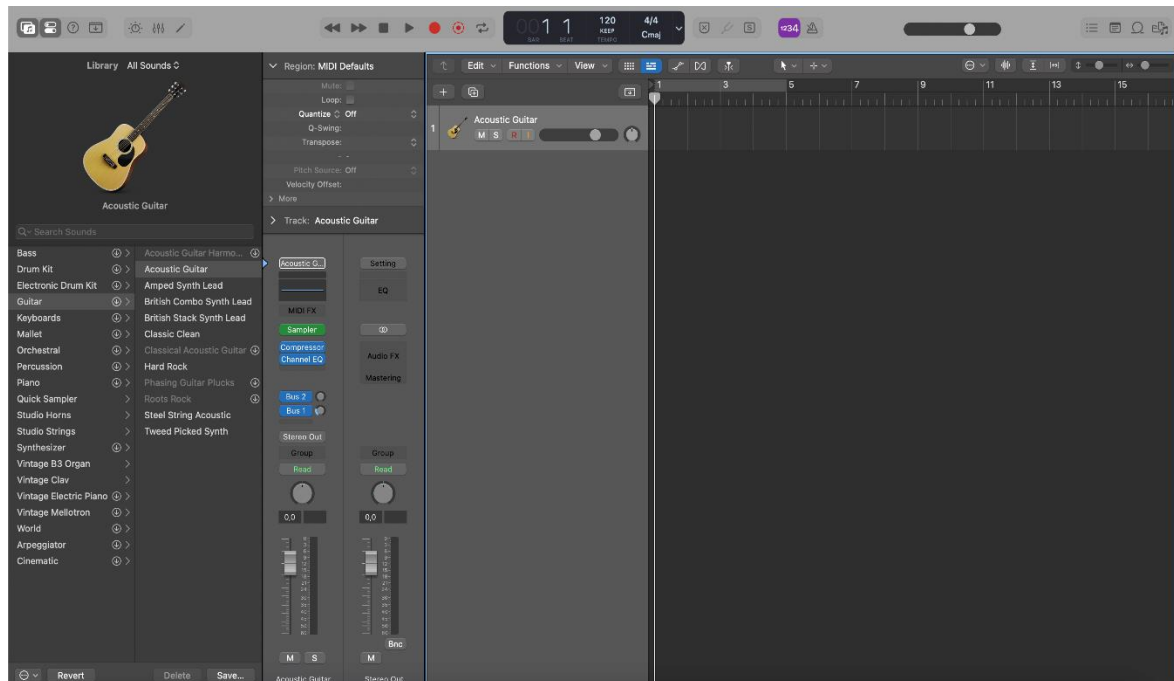

Figure 7. Screen View of Logic Pro DAW

At this stage, as shown in Figure 7, the researchers selected VSTi in the instrument column in the DAW as a virtual instrument used to work on the notation of the keroncong guitar playing pattern.
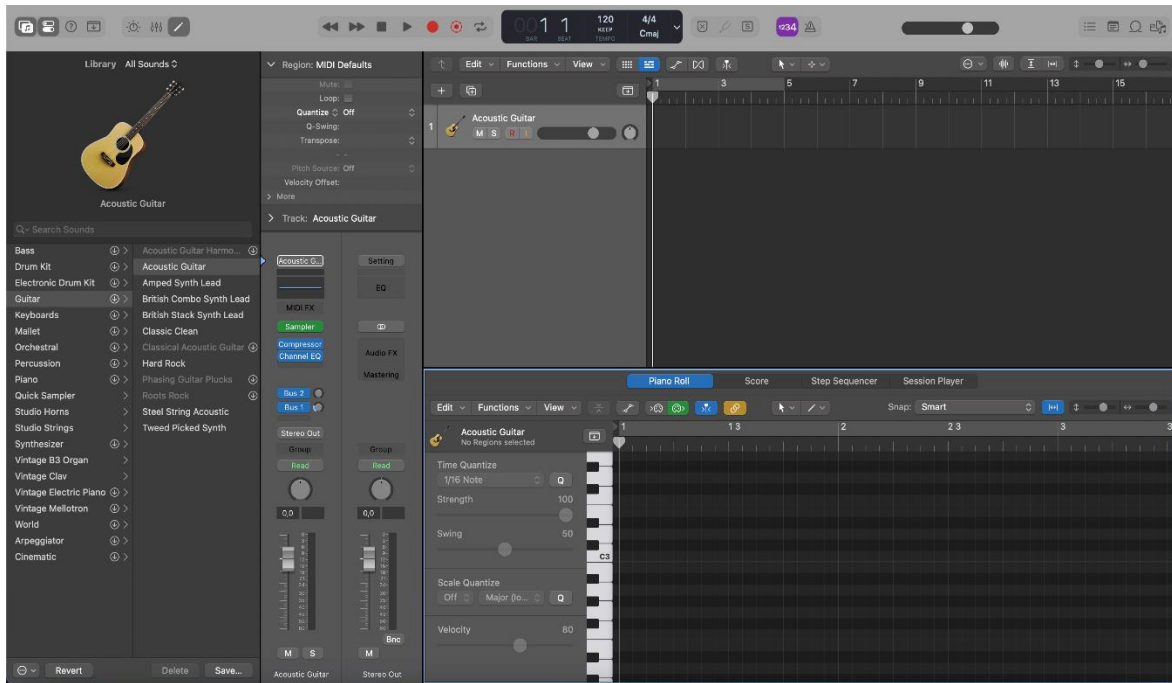
Figure 8. Logic Pro DAW - Piano Roll View

At this stage, the researchers opened the piano roll section. Here, the piano roll can be accessed by pressing the scissors symbol located at the top left of the screen. It can be seen that the piano roll was divided into several octave registers, in this VSTi the lowest note was on the E key at C1.
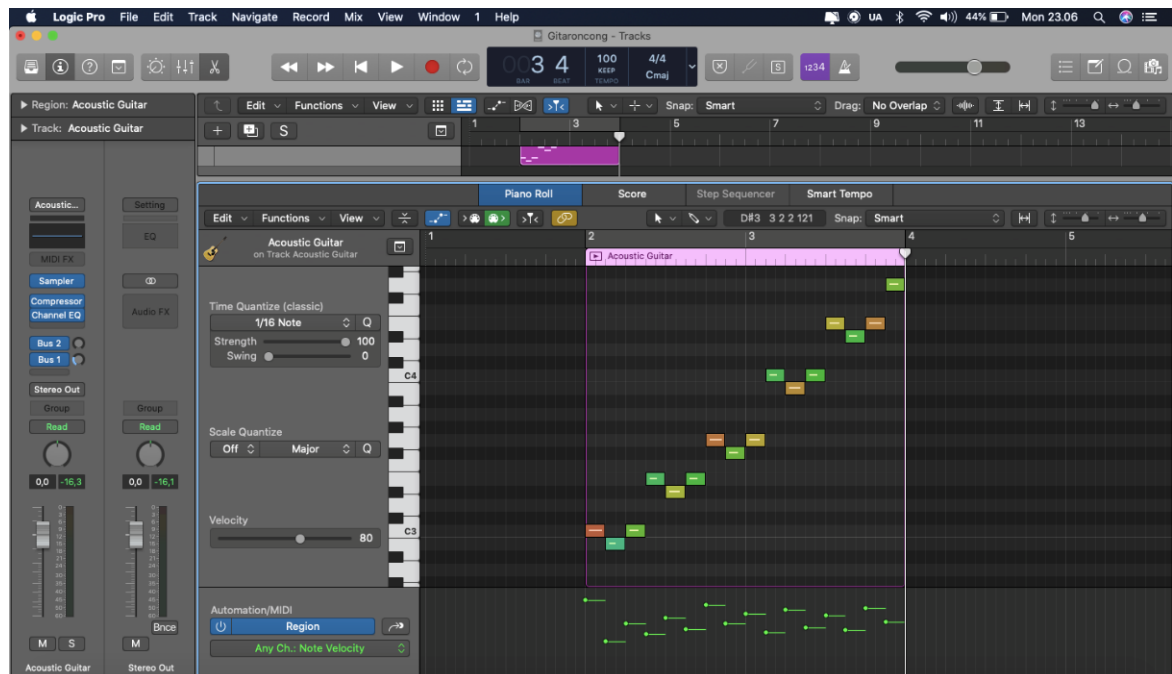

Figure 9. Transforming Staff Notation on Piano Roll Logic Pro DAW

At this stage, the notation that was prepared during pre-production was made into a piano roll. The researchers adjusted the velocity of the notes that have been loaded into the piano roll to make the guitar playing feel realistic and the dynamics are not monotonous. Then, the audio was exported into .wav format. After that, the notation creation was repeated based on the tonality system and the direction of the melody movement as previously planned. After exporting, researchers classified the files based on the notations they had created (see Figure 10).
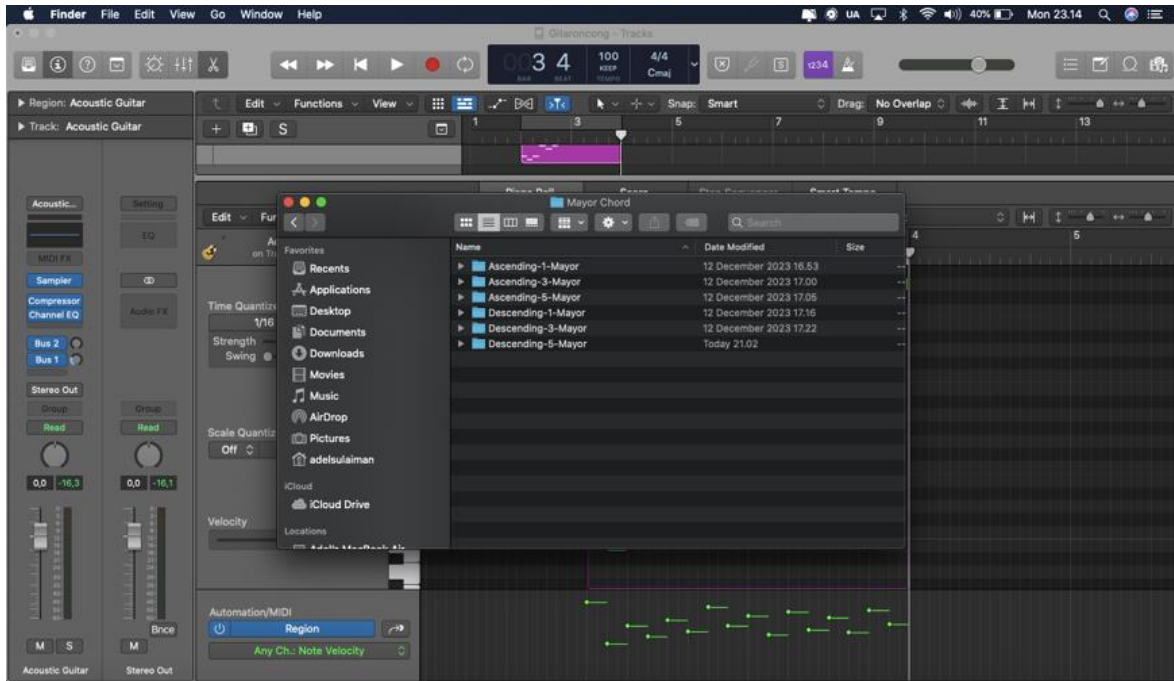
Figure 10. Classification of Exported Audio Results

Folder classification was made based on the major and minor systems of exported patterns and the direction of melody movement. Audio data were loaded into one grouped folder to make it easier to map to the Kontakt Library later. The audio mapping stage is presented in Figure 11.
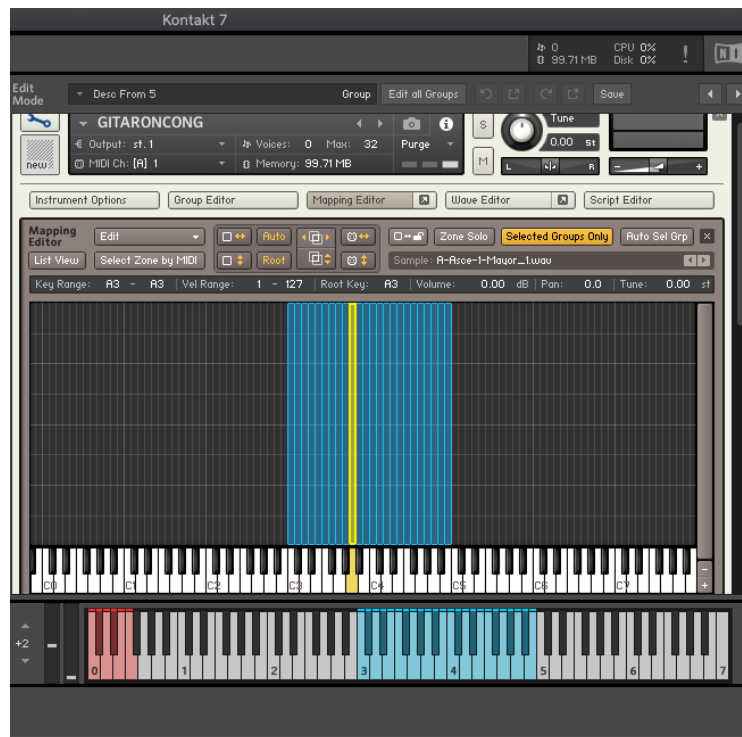

Figure 11. Exported Audio Mapping

As seen in Figure 11, the classified audio file mapping was loaded into each group of piano keys available in the Kontakt Library based on the tonality of each audio sample. Then, it was followed by grouping the loaded groups and creating key switches, which can be seen in the red piano keys above.

Post-Production

Post-production is an important stage in the development of VSTi Gitar Keroncong, where the testing and assessment processes were carried out to ensure the functionality and quality of the virtual musical instrument that has been created. At this stage, VSTi was tested in a keroncong music composition, involving various instruments such as cak, cuk, and guitar. This process was carried out to assess how the VSTi was integrated with other instruments and how well it was able to maintain the characteristics of keroncong music.

The test results show that the VSTi Gitar Keroncong did not only work well in conveying the energy and nuances of keroncong music but also provided users with a variety of options in terms of accessibility and ease of improvisation. Table 1 below summarizes quantitative data on the results of post-production testing, providing an overview of how users perceive the effectiveness of the VSTi in practice.

Table 1. Export Audio Mapping

No.	Assessment Aspects	Total Compositions	Average Improvement in Sound Quality	Percentage of Satisfied Users
1	Ability to Integrate with Other Instruments		25	85
2	VSTi Sound Quality	10	30	90
3	Flexibility in Playing		20	80
4	Ease of Access for Improvisation		15	75

From Table 1, gitar keroncong VSTi demonstrated consistent improvement across various assessed aspects. The 30% average increase in sound quality indicates that the VSTi successfully produced a more realistic sound, closely matching the characteristics of keroncong music. With 90% of users satisfied with its sound quality, the VSTi met the expectations of musicians. Its ability to integrate with other instruments, such as cak and cuk, resulted in a 25% average improvement, facilitating harmonious reproduction and offering a richer, more dynamic playing experience.

All test participants reported that the VSTi worked effectively within a composition, enhancing the synergy between instruments. The VSTi's flexibility also received positive feedback, with 80% of users noting its ability to allow improvisation in various musical contexts. Additionally, 75% of users found it easy to improvise with the VSTi, confirming its success in helping musicians explore their creativity. Post-production results further validated that the keroncong guitar VSTi not only performed well but also proved to be a highly valuable tool for musicians. Its quality, flexibility, and seamless integration in musical compositions make it a promising innovation in keroncong music education and practice.

Discussion

This study shows three core stages in making keroncong guitar VSTi, namely pre-production, production, and post-production. In the pre-production stage, the researchers collected data through observation of conventional keroncong music works. This step was fundamental as the basis for designing the right notation, which will be processed in the next process. This is in line with the view of Pratama & Latifah (2023) emphasizing that individuals in the music field can now utilize various software such as Kontakt libraries and DAWs to produce and learn music. This practice shows the recognition of the importance of technology in enriching the understanding and experience of learning music. As the results have been presented, keroncong guitar playing is done improvisationally with various improvisational ideas including the application of non-harmonic tones (Kusumah, 2021). For every educator or musician, improvising requires special abilities which are acquired through an understanding of the principles of improvisation (Hennekam, 2022). Hendriyana (2021) confirms that these stages can produce works and/or learning media.

Pre-production showed the prepared notations were transformed into audio of improvisational patterns playing on a keroncong guitar. The application of non-harmonic tones lay in the chromatic notes before the notes that became harmony in a chord. The melody movement is arranged in ascending and descending order to make it easier for VSTi users to arrange the keroncong guitar

playing based on the direction of the melody movement that follows the movement of the chord in a progression. The designed notation paid attention to the major and minor systems of a chord. Then, at the production stage, the realization of the notation into audio where the transformation process was carried out through the use of a guitar VSTi that is already available on the DAW by also adjusting the velocity to adjust the dynamics to make it feel more realistic and not monotonous. After that, the researchers exported the audio to obtain data in .wav format, which was mapped to the midi system through the Kontakt library. The final result was tested on the VSTi using DAW by creating a keroncong music composition to test that the VSTi can operate as intended.

The production stage involves the implementation of the designed notation into audio. By utilizing the guitar VSTi available in DAW, researchers can produce more dynamic playing patterns. Velocity settings in production aim to create a more realistic sound, while still maintaining the characteristic improvisation inherent in keroncong guitar playing. This is in line with the opinion of Cano et al., (2018) and Portowitz et al., (2014) revealing that the use of technology in music arts education must be considered by educators to create an optimal learning environment.

Next, the post-production stage includes the process of exporting audio and mapping in Kontakt Library, which serves to organize the playing pattern in a way that is easily accessible to users. This process did only increased the ease of use of VSTi but also contributed to efforts to preserve keroncong music in an educational context. This has a positive impact on the ability of educators to integrate technology into the curriculum, strengthening Swanwick (2001) argument regarding the relationship between music technology, cultural heritage, and music arts education that influence each other.

These steps have shown the process of making the keroncong guitar VSTi as a learning medium for keroncong music arrangement and also an audio reference to overcome the limitations of musicians in playing the keroncong guitar. In its use in learning media, technology in music arts education in general is something that is considered important to improve the quality of learning (Carlisle, 2013). DAW in its use has shown its capacity to accommodate the musical creativity of each individual. (Gorbunova & Govorova, 2018; Hidayat & Syafwandi, 2022; Pendergast, 2022).

Keroncong guitar VSTi can be integrated into the music curriculum at various levels of education. For example, in high school, music teachers can use this VSTi as a teaching tool for improvisation. Through practice sessions, students can practice playing keroncong guitar while applying the playing patterns that are available in the VSTi. In addition, another scenario is to hold a workshop where students work in groups to create keroncong music compositions using this VSTi, allowing them to collaborate and improvise directly. By implementing VSTi in various practices and activities, educators can provide a more interactive and creative learning experience, and encourage students to develop their improvisation skills in cultural traditions. This also creates space for more open musical exploration, where students can learn and adapt to various new styles and techniques. (Riyadi & Budiman, 2023).

The findings of this study support previous literature, which asserts that technological advances in music arts education enable educators to make significant innovations in learning (Frenki et al., 2018; Gunawan, 2023; Pratama & Latifah, 2023). Skills in using technology not only enrich the learning experience for students but also preserve and develop musical heritage for future generations. This initiative is expected to pave the way for further research in the context of developing virtual musical instruments that support music arts education more broadly.

CONCLUSION

The virtual instrument product of the keroncong guitar developed in this study addresses the rapid technological advancements in music education. VSTi not only serves as a tool for learning keroncong music but also as a reference for musicians in creating compositions. Consultations with keroncong music practitioners confirmed its usability, while also highlighting the need for further development to expand the variety of keroncong guitar patterns. The VSTi offers a practical solution for music educators, enhancing improvisation teaching methods and enabling a more interactive and engaging learning experience for students. Technological proficiency is now essential for educators

to provide innovative and relevant teaching, while creativity in designing technology-based learning tools is crucial for fostering innovation in music education. Also, the rise of diverse music applications opens opportunities not only for educators but also for musicians and composers to explore their creativity through technology.

This study encourages musicians to participate in developing music technology as a creative platform. Future research should explore additional guitar patterns and refine the user interface, enhancing the VSTi's support for music learning and practice. Identifying new advancements in music education technology will enrich the educational and creative experience for both educators and students. Thus, the keroncong guitar VSTi is more than an innovation; it is a catalyst for transformative changes in music education, paving the way for more effective and engaging learning in the future.

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