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doi:10.1088/1742-6596/1364/1/012027 1 Designing Guitar Tuning Software Using
Karplus Strong Algorithm Dahlan Abdullah^{1*}, Kevin Angkasa², H Hartono² and Herman
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Engineering, Universitas Malikussaleh, Aceh, Indonesia * dahlan@unimal.ac.id Abstract.
Tuning is the process of adjusting strings on stringed musical instruments such as
guitars.

If the instrument is played frequently, the settings will change. For this reason, the
tuning process is usually carried out to get the right settings so when the notes are
produced the standard becomes. In addition to how to listen, then tuning can also be
used in the tuning process.

The tuning technique must also be adjusted because there are usually several types of
tuning for musical instruments. The implementation of this paper is design tuning
program for musical guitar instruments with tuning settings for 7 types along with 36
tuning types. In addition, this program also provides customized tuning inputs for other
stringed instruments. 1.

Introduction Musical instruments that use strings such as piano and guitar when used
frequently, then at one time a calibration process must be carried out again, known as
stem or tuning [1][2]. The piano must use a device called a tuning fork. Especially for
musical instrument such as guitar can directly set through the ear string.

Adjusting to the guitar does not require a special tool to rely solely on the player's skill in adjusting the strings to get the desired tone position on the guitar. For the above problems, usually an expert and professional must carry out the stem process. Another problem is the many types of guitars and variations in tuning that must be done such as for the purposes of playing classical songs, jazz, and pop rock.

One solution to this problem is to create a software for the tuning process where the program is designed to produce a certain tone from the six guitar strings through the output wave [3]. A person who needs this type of tuning immediately adjusts to get the same string position as the sound from the program output. To produce sound that resembles the sound of a guitar, we need a special technique or algorithm that can simulate the sound of a guitar [4][5].

The algorithm in question is the Strong Karplus Algorithm. Strong Karplus Algorithm is a wavetable synthesis algorithm that carries out its own modifications. The working method of the synthesis of this physical model is to loop the short waveform through a delay on the filter to simulate the sound of the strings being picked as in percussion instruments. The result of this algorithm is a form of wave that sounds like the sound of a guitar picked for a certain tone [6]. 2.

Related Works Strong Karplus Algorithm was developed by Alexander Strong and analyzed by Kevin Karplus as a model for o'clock or plucked musical instruments [7]. This algorithm simulates sharp-pitched impacts through wide-band signals such as collection of noise. The signal is fed through a delay line where the 2018 1st Workshop on Engineering, Education, Applied Sciences, and Technology Journal of Physics: Conference Series 1364 (2019) 012027 IOP Publishing doi:10.1088/1742-6596/1364/1/012027 2 length depends on the frequency of the desired note.

The delayed signal is sent through a lowpass filter to smooth out all other frequencies except the frequency of the desired tone. The concept behind the Strong Plus algorithm is to model the form of frequency not a stringed instrument with noise that is termed white noise which has the same energy in all frequencies [6][8].

Because of the other parameters of the instrument cavity, instrument material, and variety, only the given frequency and harmonics will resonate, then this can be simulated by recursively forming the output signal. By matching the length of the delay time to match the desired record frequency, the final output of the sound at the selected frequency is given a short time [9].

The feedback loop only strengthens the fundamental and harmonic frequencies. 3. Research Methodology 3.1. Selection Analysis Method Strong Karplus Algorithm method was used because this method is a wavetable synthesis algorithm that carries out its own modifications. The working method of the synthesis of this physical model is to loop the short waveform through a delay on the filter to simulate the sound of the strings being picked as in percussion instruments. The result of this algorithm is a form of wave that sounds like the sound of a guitar picked for a certain tone.

The design program will be named Easy Tuner. Easy Tuner is a simple and straight-forward program designed to help the tuning process for stringed instruments such as guitars [10]. 36 different tuning programs can be selected and by default there will be a choice of 7 (seven) types of guitars namely Acoustic Guitar (Steel), Acoustic Guitar, Electric Guitar, Electric Guitar (Clean), Electric Guitar (Muted), Overdriven Guitar, and Guitar Distortion.

This program is also equipped with inputs for other musical instruments so that the number of tuning later is not only limited to these seven types of musical instruments. The program uses the built-in Windows MIDI function to simulate each instrument so that it is easy to do tuning on types of stringed instruments. The process of tuning in this case is the user determines what musical instrument will be tuned and determines the type of tuning.

Each type of tuning has its own frequency. So the program can be designed to play that frequency. The program that was created later made it easier for users to do tuning by providing buttons that represented each string on stringed instruments [11]. Users just press the button for example the first button for the first string and the sound that is issued is a form of tuning for this string.

So the user just adjusts while plucking the string until the sound is similar to the sound produced by the program. 3.2. Determine The Types of Instruments Supported by MIDI On a sound card there is usually a chip intended to play MIDI format. The chip controls the input and output of MIDI synthesis. By default there are 128 kinds of instruments that can be synthesized with this chip.

Each instrument has its own code, so to play an instrument the MIDI file format has saved the code and with the play command directly sends the code to the sound card, then the sound card that arranges the code and plays the choice of instruments according to the code, frequency, and the duration. In the selecting of this type of instrument there are only seven choices used for the seven choices of guitar musical instruments as the default choice, namely the choice of instrument code # 24 to # 30,

namely for Acoustic Guitar (Nylon), Acoustic Guitar (Steel), Electric Guitar (Jazz) , Electric Guitar (Clean), Electric Guitar (Muted) Overdriven Guitar, and Guitar Distortion.

2018 1st Workshop on Engineering, Education, Applied Sciences, and Technology
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doi:10.1088/1742-6596/1364/1/012027 3 Table 1. Instrument Code on General MIDI
Instrument Code # ACOUSTIC GUITAR NYLON 24 ACOUSTIC GUITAR STEEL 25 ELECTRIC
GUITAR JAZZ 26 ELECTRIC GUITAR CLEAN 27 ELECTRIC GUITAR MUTED 28
OVERDRIVEN GUITAR 29 DISTORTION GUITAR 30 3.3.

Functional Requirement Analysis In this research the application that will be designed is an application that can perform data insertion and data extraction processes [12][13][14], where the required software will be analyzed as follows: 1. There is a type of browse folder in the form of a treeview, making it easier for users to select files from the folder to be processed.

This view must be integrated with the main form so that the folder can be directly selected. 2. There is a list that is implemented using listview which will contain information such as file name, file date / time, original size, size after processing, attribute, status, pattern, and process time. Specifically for this latest information, it is used for long process testing. 3.

There is a status bar at the bottom of the form to display the status of the file being processed. 4. To facilitate the user, the choice of commands to process files can be made in the form of menus and toolbars. 5. A pop up menu is also available (click with the right mouse) to select files and organize files into lists such as marking files, deleting files from the list. 6.

The file structure design can automatically add an identification tag so that the file cannot be processed a second time. The application built in connection with steganography in this wave file has the following specifications: 1. Receive input of original wave file and wave file that has been inserted data. 2. Able to insert data into wave files. 3.

Save the wave file that has been inserted in the data. 4. Able to extract wave files that have been inserted data to obtain a valid data file. 5. Able to play wave files, so users can observe changes that occur before and after the wave file is inserted in the data. After the process of indentifying of the model, then the next step is the estimation and model testing. 4. Result and Discussion 4.1.

Design The interface is a media interaction (interactive) between the computer and the user (user). In graphical-based operating systems (graphic user interfaces or GUIs) such as Windows, the interface of software is usually a window. Through this window the user can interact with the software he uses.

In object-oriented programming languages such as Visual Basic it is to form a window or window by forming a form object that inserts other graphic components [15]. The design of this program includes the placement and compilation of objects contained in the Visual Basic form. The form that was designed in advance was made a basic design to make it easier when creating a design in Visual Basic.

In the application are designed two forms, namely the main form, other forms, form customize, form menu, and form splash screen. All of these forms are designed 2018 1st Workshop on Engineering, Education, Applied Sciences, and Technology Journal of Physics: Conference Series 1364 (2019) 012027 IOP Publishing doi:10.1088/1742-6596/1364/1/012027 4 using basic objects from Visual Basic such as command buttons, option buttons, labels, images, combo boxes, and text boxes.

In Figure 1 below is a design form from the form splash screen that will appear first when the program is loaded. Figure 1. Design of the Splash Screen Dialog The main components of this form only use picture, label, and timer objects. The picture is used to display the guitar image, while the label serves to display the descriptions and the timer is used to set the length of the display form.

The setting of property values for each object in the splash screen dialog design can be seen in Table 2 below. Table 2. Setting Objects in the Splash Screen Dialog Object Type Function Property Setting frmSplash Form Form Display Title in the Window Title The form is displayed on the taskbar The position of the window when displayed BorderStyle Caption ShowInTaskbar StartUpPosition 0 'None "Splash Screen" 0 'False 2 'CenterScreen 4.2.

Discussion In guitar tuning, there is a choice of instruments to be chosen, the type of tuning and duras not on the choice of instruments there are 7 types of guitars including: acoustic guitar (steel string), acoustic guitar (nylon thread), electric guitar (jazz), electric guitar (clean), electric (mused) guitars, overdriven guitars, and distortion guitars where each guitar has a distinctive sound characteristic so the voice played on the program will also differ according to the original sound [6].

The types of tuning in this program are 36 types where the 36 types of tuning have a high low frequency different tone (increase and decrease) according to the desired type

of tuning, for example in A minor a decrease in the initial tone. In 2-Step tuning down there is an increase from the initial tone and so on [16]. The duration of the note is the length of frequency time of the note is played where the duration can be set from score 1-9.

When selected electric guitar with a standard type of tuning of 5 seconds duration, the electric guitar sound will emerge with a standard tone and sound 5 seconds, so if the tuning type is down 1 step, then the electric guitar will appear with a down tone 1 step and sounds 5 seconds on the other tuning options, the instruments are outside of the 7 guitar instruments on the guitar tuning 2018 1st Workshop on Engineering, Education, Applied Sciences, and Technology Journal of Physics: Conference Series 1364 (2019) 012027 IOP Publishing doi:10.1088/1742-6596/1364/1/012027 5 options. It depends on customized tuning.

If in the customize section there are 8 then 8 other tuning will appear, different from guitar tuning where 36 types of tuning can be selected in the options. It's different from tuning on standard parts which can only do tuning on a guitar musical instrument. On the tuning customize form, custom tuning can be done where the frequency entered is also in accordance with existing needs, new choices in the instrument code to make 128 new settings for the instrument where the entered code will automatically appear in the instrument name, number of strings which is entered in accordance with the wishes of the user, which is chosen from 1-6 and the type of tuning used is only the standard tuning and then the settings on the first string are carried out until the sixth string, after which it is stored and played. In other form instruments, other tuning instruments can already be removed.

For example, used instrument code 5, then the name of the instrument will automatically appear electric piano, then the desired number of strings is chosen and can be given the name as desired, after that the setting of the desired frequency is entered on the first, second, third, and so on stored and played on other form instruments. On this customize form, only standard tuning types can be used [17]. 5. Conclusion The conclusions that can be taken after this research are: 1.

With the tuning software for stringed instruments, it can help the user in carrying out the tuning process themselves. 2. Tuning is done by using MIDI Value which is played directly by sending the value through the midiOutShortMsg command based on the value generated by the Strong Karplus Algorithm. 3.

The selection of the tuning process can be done for 36 different types of tuning where this option includes all musical instruments tuning such as a guitar. 4. The results of

designing this application can be used as a program to perform the tuning process. 5. From the results of the design and implementation carried out, the main purpose of designing this application is to produce an application that can be used to do.

References [1] J. Sloboda, Exploring the musical mind: Cognition, emotion, ability, function. Oxford University Press, 2005. [2] A. H. Benade, Fundamentals of musical acoustics. Courier Corporation, 1990. [3] D. Arfib, J.-M. Couturier, and L. Kessous, "Expressiveness and digital musical instrument design," *J. New Music Res.*, vol. 34, no. 1, pp. 125 – 136, 2005. [4] C. R.

Sullivan, "Extending the Karplus-Strong algorithm to synthesize electric guitar timbres with distortion and feedback," *Comput. Music J.*, vol. 14, no. 3, pp. 26 – 37, 1990. [5] D. Sudrajat, I. Mulyaningsih, C. Kurniawan, I. N. Sari, and E. P. Permana, "Computer assisted instruction model for mathematics education," *J. Adv. Res. Dyn. Control Syst.*, vol. 10, no. 13 Special Issue, pp. 1613 – 1616, 2018.

[6] E. Miranda, Computer sound design: synthesis techniques and programming. Focal Press, 2012. [7] M. Karjalainen, V. Välimäki, and Z. Jánosy, "Towards high-quality sound synthesis of the guitar and string instruments," in *Proceedings of the International Computer Music Conference*, 1993, p. 56. [8] X. Serra and J. Smith, "Spectral modeling synthesis: A sound analysis/synthesis system based on a deterministic plus stochastic decomposition," *Comput.*

Music J., vol. 14, no. 4, pp. 12 – 24, 1990. [9] X. Serra, "Musical sound modeling with sinusoids plus noise," *Music. signal Process.*, pp. 91 – 122, 1997. [10] S. T. Johnson, "Instructional systems and methods for musical instruments." Google Patents, Feb-2001. [11] P. Okulov, U. Fasano, and J.-P. Paradis, "Electronic stringed musical instrument." Google Patents, Feb-2001.

2018 1st Workshop on Engineering, Education, Applied Sciences, and Technology *Journal of Physics: Conference Series* 1364 (2019) 012027 IOP Publishing doi:10.1088/1742-6596/1364/1/012027 6 [12] D. Darwis, "Implementasi Steganografi pada Berkas Audio Wav untuk Penyisipan Pesan Gambar Menggunakan Metode Low Bit Coding," *EXPERT*, vol. 5, no. 1, 2015. [13] A. Iskandar et al.,

"Web based testing application security system using semantic comparison method," in *IOP Conference Series: Materials Science and Engineering*, 2018, pp. 1 – 6. [14] R. Rahim et al., "Hashing Variable Length Application For Message Security Communication," *ARNP J. Eng. Appl. Sci.*, vol. 14, no. 1, pp. 259 – 264, 2019. [15] G. L. Ginting, "Perancangan Aplikasi Pembelajaran Cascading Style Sheets dengan Metode

Computer Based Intruction, " Pelita Inform. Inf. dan Inform., vol.

3, no. 1, 2013. [16] M. A. Ayu and T. Mantoro, " An example-based machine translation approach for Bahasa Indonesia to English: An experiment using MOSES, " in 2011 IEEE Symposium on Industrial Electronics and Applications, ISIEA 2011, 2011. [17] H. H and M. Rafi, " BlogNewsRank: Finding and Ranking Frequent News Topics Using Social Media Factors, " JOIV Int. J.

Informatics Vis., 2018.

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