PC BASED PIANO

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Abstract— **The conventional piano is not portable and often**

expensive, its versatility and ubiquity have made it one of the world's most familiar musical instruments.Here in this paper, Proposing PC based Piano by using MATLAB software.In this paper we had used the two most powerful features of the MATLAB i. e GUI(Graphical User Interface) and the MIR (Music Information Retrieval) Toolbox to generate various frequency tones of a piano. This paper presents how Matlab generates virtual keyboard of a piano via GUI then click on key using mouse then it will generate that tone ,here we had write audio signal for sequence of played notes into .wav file. When key is pressed, Synthesizer generates sinusoidal tone sequence signal x[n] in .mat file which is pure sinusoidal tone.And depending upon which key is pressed the frequency related that key will be played, and related to that particular frequency the graph of amplitude, magnitude and phased will be displayed on screen.

Keywords: MATLAB software,MIR(Music Information Retrieval) toolbox, GUI(Graphic User Interface), .wav file.

I. INTRODUCTION

In this study, piano recordings have been analysed using both traditional acoustic analyses as well as programming procedures in MATLAB. Music related information have been found from piano recordings using sound editing software Audacity as well as the MIR (Music Information Retrieval) Toolbox in MATLAB. The Department of Electronics and Telecommunications at NTNU is involved in research on musical performology. Analyses of audio signals were performed using MATLAB in addition to analysis performed by applying various functions from the MIR Toolbox.

A. Piano timbre

The literature presented in the following is relevant in the discussion of piano timbre; how sound is produced on the piano and how a timbre can be modified, how the room may influence timbre, and how musical sensation changes with the room or musical gestures. The sound from a piano is caused by a series of closely successive events.

The piano is a percussive, stringed instrument, where each string corresponds to a key on the piano keyboard. When a key is pressed down, this activates a set of levers connected to each other. The motion of the levers leads to a hammer hitting the string. Vibration Of the string are transferred to the soundboard via a wooden bridge, causing the soundboard to resonate.

The formula for the frequency of a vibrating string is:

$$F0 = 1/2L\sqrt{(T/M)}$$

where L is the length of the string, T is the tension and M is mass per unit length The string's stiffness becomes more and more apparent with higher frequencies, resulting in sharper overtones when pressing the higher register keys on the piano.

B. Review of Literature

Ortmann's "The Physiological Mechanics of Piano Technique" from 1929 gives an elaborate review of the parts of the skeleton used for piano playing as well as the relevant muscles. He also presents various timbres, provided with descriptions and playing techniques. Drawings of lines and arrows explaining movement of the arm are presented, found from his research on piano technique.

More recent research such as Silva et al have studied different recordings of the same

music. Performed analysis included computing self-similarity matrices in order to detect structural similarities between the audio signals as well as chroma-based signal properties,

and their method proved to be successful. Chroma give information on the harmonic nature of the signal. For the chroma analysis, the Chroma Toolbox in Matlab was used.

II. PROPOSED WORK
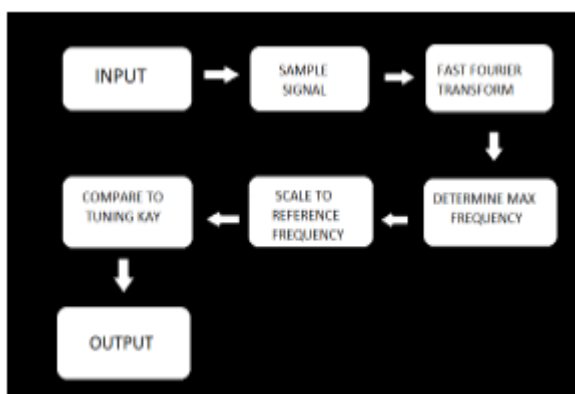
Block Diagram

As shown in block diagram, we are giving input through virtually generated keyboard, This will pass the signal ahead in the block of sample signal here the signal is converted into digital signal this signal is sampled based on the nyquist criteria or nyquist sampling rate, then Fast Fourier Transform of that signal takes place, then it determines maximum frequency, after this operation that signal is scale to reference frequency then it will compare to tuning key and from that we get an output signal.

MATLAB supports developing applications with graphical user interface features. MATLAB includes GUIDE (GUI development environment) for graphically designing GUIs. It also has tightly integrated graph-plotting features. For example, the function plot can be used to produce a graph from two vectors x and y.
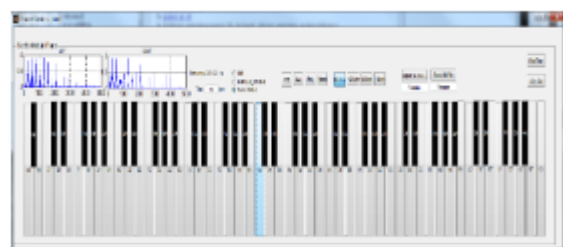
A. Virtual Piano Working

The virtual piano is played using your keyboard and/or mouse and typically comes with many features found on a digital piano, if not more. Virtual player piano software can simultaneously play MIDI / score music files, highlight the piano keys corresponding to

the notes and highlight the sheet music notes.

Timbre is a well known concept in music and denotes adjectives describing a sound orsound sensation. All instruments possess a characteristic timbre making it possible to distinguishone type of instrument from another. An instrument can also produce a range ofdifferent timbres. It is highly relevant for a musician knowing about these innate propertiesof the instrument, as well as appropriate technical skills in order to change the musicalexpression.
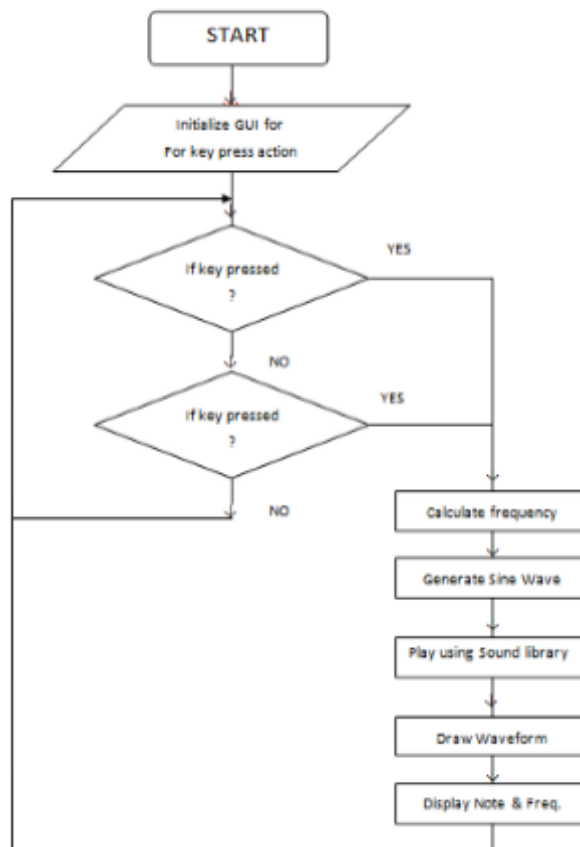
III. IMPLEMENTATION

From the actual piano,we have analysed frequencies of each key and we have alloted those frequencies to vitual keyboard.And we also studied that,how to simulate the graph of each frequency tone by using graphical user interface(GUI).

This is how My Piano GUI looks like:

Flowchart

A. Flow chart explaination:

• The program starts with initializing GUI using key pressing action which is displaying on monitor.

• If key pressed by keyboard.

• If it is senses then it calculates the frequency.

• Depending on frequency it will generate sine wave.

• Play the sound using sound library.

• drawing wave form depending on the sound frequency which is generate while pressing.

• each note and frequency is displayed on the monitor.

• If key pressed by mouse .

• If it is senses it will follow same procedure

• If both, key board & mouse dose not sense any press it will wait for the next press.

Application:

• Creating various digital instruments

• By analyzing graph of each timbre,music directors can produce better sound.

• Performance of this piano is consistent and portable,we can carry it anywhere.

IV. FUTURE SCOPE:

The performed method of analysis seems to be insufficient. A large amount of research material is available from the piano recording sessions making it possible to perform additional analysis.

The MIRToolbox procedures may be partly inadequate for analysis detecting timbral differences, or possibly should additional MIRToolbox functions be considered.Other analysis procedures may be developed or improved in order to contribute to mapping perceived timbral properties with actual physical features of the signal. MIDI recordings may be studied in order to give a more precise dynamic and temporal analysis. The latter enables a better identification of differences in timing.

Conducting hearing tests may be considered. Introducing the various recordings to a group of people unfamiliar with the content of the project might be informative in termsof finding out more about how the various timbres are perceived.

V. CONCLUSION:

Virtual piano already exists but one cannot analyze frequency graph of each tone hence to analyze the frequency graph, here preferring MATLAB software. For displaying graph, the most powerful feature of MATLAB i.e. GUI (Graphical User Interface) is used and for giving input to each and every key here preferred MIR Toolbox. As everyone knows that in all around the world, Digitization of each and every thing is done. As there was a problem in previous conventional piano, it was not easy to handle due to bulky size.

REFERENCE

• "Digital Signal Processing" by Emmanuel C Ifeachor and B W Jervis

• "Digital Signal Processors" by B Venkataramani and M Bhaskar

• http://in.mathworks.com/products/matlab/

• https://www.cs.sfu.ca/~skristja/personal/project768skristja.htm?_e_pi_=7%2CPAGE_ID10%2C9499793509

• Mathematical Harmonies by Mark Petersen

• Course Notes for Engineering 100 Music Signal Processing.