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Hand Gestured Music Generator: A Survey

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Abstract- In a world full of technological miracles, art is something that goes under the radar. Combining automation with music will lead to great advancements in both technology and the art sector. There are many who wish to learn musical instruments but are unable to do so due to the time and effort it requires. But with this device, they would be able to learn any musical instrument without possessing musical knowledge. This can be achieved by integrating an Arduino and X-motion sensor by Parallax. Then integrate MAX and Ableton software to convert the digital signal into a MIDI signal and to generate music notes based on that MIDI signal.

Keywords:- Hand gesture, music generator, MAX 8, Ableton.

I. INTRODUCTION

Many times we notice artists struggle to use technology to make music and technologists learn music. To bridge both artists and technologists, we aim to make such a system where with minimal knowledge of both technology and music, people can create, compose and produce music.

Automation has already entered our lives and it is only a matter of time when almost all creative and productive work would also be carried out by automation. Similarly, music automation can help musicians to overcome their mental blockage and compose different types of melodies & invent new genres. Entertainment in the form of music has been passed on from centuries from different cultures and hence it is important to conserve them by using technology. Enabling hand gestures to create music will open up many possibilities for musicians to express their art in many new dimensions.

Technology in music has been evolving in every decade or so, showing us the transformation from records, to cassettes to CDs and finally to online streaming. The next step in this transformation is the introduction of automation in the making and Work station). These DAW help music producers to arrange tracks effortlessly giving them more time to think creatively. Gone are the days where instrumentalists were called into the studio to record their pieces or to synchronize a live orchestra. Since the introduction of DAWs, all the instruments have been used in digitalized format, softwares called VST (Virtual Studio Technology), which enables a music director to make music directly from the computer by using these softwares. Hence it reduced the human involvement in making a song. Currently almost 100% of the songs are made using DAWs and 90% of them use VSTs. To take this technology further, we intend to make a system which converts hand gestures into digital signals which are then corresponded to a MIDI signal, by which the VST operates.

II. LITERATURE SURVEY

In 1999, J.A.Paradiso proposed first design of gestural sensors for musical interaction and filed the patent for it. His design was very basic. It included an array of new musical instruments and interactive installations developed for the Brain Opera.The Brain Opera was a large, touring multimedia production wherein the audience used to experience a set of musical modes at various interactive stations, before

the instruments were actually performed on stage before them.

Paradiso developed outlines the hardware and sensor systems behind these devices: the electric field sensors of the Gesture Wall and Sensor Chair, the smart piezoelectric touchpads of the Rhythm Tree, the instrumented springs in Harmonic Driving, the pressure-sensitive touch screens of the Melody Easels, and the multimodal Digital Baton.

In 2000 A. Camurri, S. Hashimoto, M. Ricchetti, A. Ricci, K. Suzuki, R. Trocca, and G. Volpe filed a patent for EyesWeb. This system was capable of developing a real time analysis of body movement and gesture. This information was then used to control and generate sound, music and visual media. They addressed the theory of paradigmatic correspondence between motion and music.

In 2003, C. Dobrian and F. Bevilacqua developed a system of controlling music through gestures using the Vicon 8 sensors and patented it. The system was developed on a software which received data from a Vicon motion capture system and translate or map that data into data for the control or music or other media such as lighting. In addition to the commercially standard MIDI—which allows direct control of external synthesizers, processors, and other devices—other mappings are used for direct software control of digital audio and video.

Recently in 2017 [4] Omkar Vaidya, Kunal Jadhav, Lokesh Ingale and Rupesh Chaudhari developed and patented a system which controlled the music player present in the vehicles by using hand gestures.

It is reported that handling music player system in car while driving is one of the reason to distract drivers. This leads to severe accidents which are possible to life threatening. Nowadays many branded automobiles have adaptive human machine interaction system which is very expensive. To overcome the issue, hand gesture is the key to control music player system in vehicles.

They developed the hand gesture based music player control system in car using accelerometer sensor and PIC microcontroller. The setup is compact so that it can easily accommodate in music player location in car, less weighty and mainly affordable to general public. This system helps to access all functions of music player like change modes (i.e. FM/USB/ Auxiliary/MP3 player), forward, rewind and play, stop and scan operations of songs playlist.

The response time to all above functions is very quick as it uses RF trans-receivers. Our system show outperforming results about identifying accurate functions to its respective gestures and will not rely on post-processing techniques as in case of gesture recognition using image processing techniques.

Sushmita Mitra and Tinku Acharya wrote the survey paper on hand gesture recognition in 2019 recently. Gesture recognition pertains to recognizing meaningful expressions of motion by a human, involving the hands, arms, face, head, and/or body. It is of utmost importance in designing an intelligent and efficient human-computer interface. The applications of gesture recognition are manifold, ranging from sign language through medical rehabilitation to virtual reality.

In this paper, they provide a survey on gesture recognition with particular emphasis on hand gestures and facial expressions. Applications involving hidden Markov models, particle filtering and condensation, finite-state machines, optical flow, skin color, and connectionist models are discussed in detail. Existing challenges and future research possibilities are also highlighted.

III. METHODOLOGY

The "Hand gestured music generator" can be used by anyone on stage or even at home, required that the necessary software be installed. When hands are waved in front of the device, the motion sensor X-band of Parallax picks up the disturbance created by hand movements. The detected disturbances are then converted to a digital signal by the same motion sensor.

The digital signal generated is then fed to the microcontroller, Arduino UNO. Arduino acts as a middleman between the motion sensor and the MAX software. Arduino's main function is to note the distance of the hand movements from the motion sensor and accordingly send the digital signal processing to the MAX software.

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MAX will convert the digital signal into a MIDI (musical instrument digital interface) signal by performing a series of operations, which is done by building a system in the software by the means of patches that will convert the digital signal into a MIDI signal. This MIDI signal will then correspond with musical notes and would be produced by the Digital Audio Workstation (DAW), Ableton.

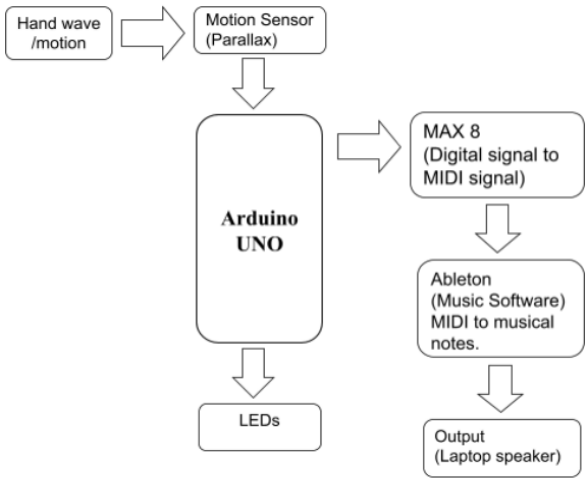

Fig 1. Block Diagram of proposed system.

IV. ADVANTAGES AND APPLICATIONS OF THE PROPOSED DESIGN

The gap between technology and performing arts is reduced. The design proposed in this paper is simple to fabricate and also to operate. This makes the system compact, less in weight and easily portable.

Any musical instruments can be easily played and also musicians will get a new dimension to explore with their music. This system will help to develop quality musicians. This device saves time of the music teacher as well as the student.The system proposed here can be used for big scale music industries studios & also for small scale home production units.

V. CONCLUSION

After doing the literature survey we can say that by configuring the motion sensors, microprocessor, and integrating MAX and Ableton, we expect to build a device that would help musicians play and perform an array of instruments that would usually take years to master. It will also help music producers to speed up music production and hence explore creativity for more depth and insight.

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