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ULTRASONIC SENSOR BASED THEREMIN

GENERATING VARIABLE FREQUENCY USING ARDUINO UNO

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***Abstract*— The world is changing at a rapid rate because of technology. The introduction of the Internet has already made a huge impact on our daily lives. With computer technologies today we are able to do so many things, which we could not even have imagined before it came into existence for real. Today new technologies are getting introduced to us and our project is based on one of it, i.e. Theremin. Theremin, an instrument traditionally based on magnetism. It is completely different than all the traditional musical interfaces we are familiar with and also which are developed over 1000 of years, whereas Theremin is a very young instrument.**

Basically, it creates two electromagnetic fields one horizontal and one vertical around it to produce sound. We made it on the basis of proximity using ultrasonic sensor and LDR. Players can control sounds by moving hands and fingers around the sensor to raise or lower the tone, and up or down over a looped antenna to control volume.

Keywords— Ultrasonic sensors, LDR, Proximity, Musical interfaces, Technology, Theremin

I. INTRODUCTION

One of the most fascinating inventions ever, the theremin revolutionized music by, among other things, inspiring the development of the modern synthesizer. With mesmerizing hand and finger motions through the air, the music appears to have materialized out of thin air. Leon Theremin created the theremin, in the Soviet Union in 1920. (Also called Lev Termen). It is made out of a box filled with radio tubes that oscillate at two sound-wave frequencies above the human hearing range; when combined, they generate a lower audible frequency equal to the difference in their vibration rates. We have created a theremin based on proximity sensors which change the frequency with changes in distances of our hand movement.

II. METHODOLOGY

There are two sensors in the circuit of a Theremin. First, the LDR is a light-sensitive resistor. When the user moves his hand around the resistor the intensity of light incident on the LDR varies. This variation changes the resistance value of the LDR. Using this property we controlled the frequency of the buzzer. The second Sensor we used is the Proximity sensor. We used this sensor to receive an analog input which let us control the voltage supplied to the buzzer as well affecting the buzzer's sound delay between each output.

We used the general syntax for the proximity sensor and LDR and put it in a loop with a baud value of 250000 for better performance. The code was written in Arduino IDE. The project was divided into two parts making the whole circuit with all the connections and then writing the whole code for the theremin and the sensors. The sensors used in this project were the LDR and HC sr04. Here the ultrasonic sensor i.e. HC sr04 was used for checking the proximity of the hand.

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III. LITERATURE REVIEW

According to previous researches done on this topics which we read our main purpose was to build a technology that can be made to interact and understand music, this has a major application in robotics field as music is different from any spoken language and if build an interaction of music with robots such that they can understand music or use it as a way of communication with us, Where Theremin acts as an antenna. Some different types of robot applications such as a robot playing an instrument or a dancing robot. Other applications include use of high-end software's and authoring tools such as MAX/MSP which can allow the simulation of current Theremin tools which can help with easy integration with Arduino or I-CubeX allowing access to other sensors. So we can control pitch and volume of the original Theremin instrument used in 1919 in which the player
Stands in front of the instrument and moves her hands close to two metal antennas. The distance from one antenna determines pitch and the distance from the other controls volume

Thereminist robot: Development of a robot theremin player with feedforward and feedback arm control based on a Theremin's pitch mode
-Takeshi Mizumoto; Hiroshi Tsujino; Toru Takahashi; Tetsuya Ogata; Hiroshi G. Okuno

Poster: Evolution of a Theremin-Based 3D-Interface for Music Synthesis-Christian Geiger; Holger Reckter; David Paschke; Florian Schulz

IV. RESULTS AND DISCUSSION

After the code was uploaded on the Arduino Uno, we made some observations to check if our code was correct and if the device worked properly.
The first observation is about the LDR. When the hand is taken closer to the resistor the frequency of the buzzer increases giving a very shrill sound output. This also meant that the frequency decreased as the hand was moved away and more light fell the LDR.
The observation is about the Proximity sensor. When a hand was taken close to the buzzer the delay would reduce making the sound more uniform. Also taking the hand away made the output less uniform and the output sound would be very broken.
The buzzer output varied from 100Hz to 1000Hz during the trial of the device

V. CONCLUSION

The Theremin works properly even with sensor inputs and only one output buzzer. The device has the ability to change the frequency of sound emitted and also can change the delay in each sound output to make it more uniform.
The project was divided into two parts making the whole circuit with all the connections and then writing the whole code for the theremin and the sensors. The sensors used in this project were the LDR and HC sr04. Here the ultrasonic sensor i.e. HC sr04 was used for checking the proximity of the hand.

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