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A NOVEL TOY PIANO USING ARDUINO

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ABSTRACT

In this project, we're building an electronic piano that can be played utilizing coke cans as user inputs. Here, the Coca-Cola cans are serving as capacitive switches. The capacitor, which has two basic characteristics, charge and discharge, functions as a switch state and a change in the dielectric leads to a change in charge, which produces a change in the analog voltage. Thus, based on these analog voltages, we may generate various piano tones for various switches in accordance with the outcomes of the music player and switch states. Following this essential operating concept, we use a human touch circuit via trig and input electric fields to build the capacitor. Following the development of the input sensor, a piano tone generator based on a timer and PWM frequency generator is used to generate the output tone. Then, we use an SD-Card to store the recordings that can be played back using a reader, convert the SD format to digital, and then again convert digital to analog using a DAC. As a result, we may create music players and piano tones based on switching states and dielectric variation, respectively.

I.INTRODUCTION

While playing an instrument can be a lot of fun and satisfying, not all aspects of music observation are always enjoyable. In this article, we focus on two often unpleasant elements: the isolation of the active and consequently the "dumbness" of instruments. The practice and mastery of musical instruments typically takes place in a private setting. A piano student spends the majority of her time by herself practicing. She or he may not always receive feedback from friends, professors, or—most importantly—random web users as the sounds of their enjoyment disperse. Analyzing her active sessions is also difficult. Although there is a technological danger involved in recording oneself and posting the recordings online, doing so requires a significant amount of work, hence it is rarely, if ever, done. Typically, instruments don't show any intelligence of their own. They are rather mechanical, even when operating digitally. Typically, they only respond to the player's direct actions, so the player alone is responsible for the instrument's quality and the music it initiates. There is no middle ground between actively making music for someone who is by themselves with an instrument and actively listening to music recordings.

A timer and PWM frequency generation is used to create output tones using a piano tone generator. Then, we use an SD-Card to store the tracks that can be played back using a reader, convert the tracks from SD format to digital, and then again from digital to analog using a DAC.

II.DESCRIPTION OF THE SYSTEM

This block diagram aids in comprehending how the system operates. There are two phases, as this application explains:

1. A piano for music,
2. A system for music players

1. Music piano system: Using the coke cans as piano switches, this system generates various sounds depending on which cane is touched.

2) Music player system: This mode can be accessed by giving the system the command "d," which we created in the application. Upon changing the liquid level of the coke tin, rather than the dielectric, the system will play a different song.

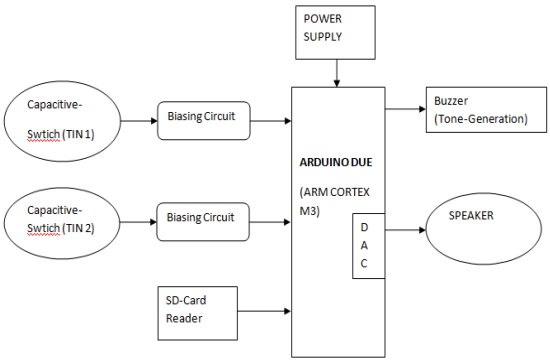

Fig.1.Block diagram

Here, the system is comprised of an Arduino that continuously measures the capacitance values of Coke cans and executes user commands.

III.SYSTEM DEVELOPMENT

The fundamental idea underlying our bit sensing approach is that each "key" on a piano is actually a device that has the potential to store an individual's electrical capacitance. The measurement may change as the user approaches the device and may experience a sharp spike in response to contact. In order to

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detect when the user has touched the key, the Arduino will be hankering after these spikes.One pin on the Arduino should be used as the "input pin" for each key, and one pin overall should be used as the "common send" pin. In addition, we will need one pin for the buzzer that will be used to produce a tone. This suggests that we could have up to eighteen keys on our keyboard because the Arduino One has twenty input pins—14 digital and two analog! That range will be much greater if you have an associate degree Arduino Mega or another board with lots of pins!

A.Capacitive Sensors: Motion, chemical composition, electric field, and many other variables that can be translated into motion or dielectric constant—like pressure, acceleration, fluid level, and composition—can all be directly sensed by capacitive sensors. Their construction involves the use of conductive sensing electrodes within a dielectric, excitation voltages approximately five volts, and detection circuits that convert variations in capacitance into variations in voltage, frequency, or pulse width.

The applications for capacitive sensors are numerous. A few are

- Flow: A variety of flow meters use an orifice for volume flow or a Coriolis effect force for mass flow to convert flow into pressure or displacement. The displacement can then be measured by capacitive sensors.
- Pressure: Using a spacing-sensitive detector, a diaphragm with stable deflection characteristics can measure pressure.
- Liquid level: By measuring variations in capacitance between conducting plates dipped in a liquid or applied to the exterior of a non-conducting tank, capacitive liquid level detectors determine the liquid level in a reservoir.
- Spacing: The mutual capacitance is a highly sensitive indicator of spacing when a metal object is in close proximity to a capacitor electrode.
- Scanned multi-plate sensor: By employing numerous plates, each addressed independently, the single-plate spacing measurement can be expanded to contour measurement. It is possible to measure both conductive and dielectric surfaces.
- Thickness measurement: If the thickness of an insulator is known, two plates in contact with it will measure the thickness; otherwise, they will measure the dielectric constant.
- Ice detector: Insulated metal strips in the leading edges of the wings can be used to detect icing on an airplane's wings.
- Shaft angle or linear position: Capacitive sensors can measure angle or position using an analog output that has a simpler circuitry and a faster response time, or a digital output with a multiplate scheme that provides high accuracy.
- Lamp dimmer switch: The standard metal-plate soft-touch lamp dimmer detects a person's body capacitance using 60Hz excitation.
- Key switch: Capacitive key switches break the coupling between two small plates by using the shielding effect of a fingertip in close proximity or a moving conductive plunger.
- Limit switch: When a plastic component or a metal machine component is nearby, limit switches can sense the difference in capacitance.
- Shaft angle or linear position: Capacitive sensors can measure angle or position using an analog output that has a simpler circuitry and a faster response time, or a digital output with a multiplate scheme that provides high accuracy.

B.Arduino: Arduino Due is the ARM cortex M3 design basedcontroller comprises of internal,16PWM‟s, 2UART, 2I2C, 2DAC, 16ADC, 13GPIO‟s and is a 32-digit engineering, having 70Mhz clock.Utilizing SPI inner we are perusing the wav record put away in SD-miniature card and play the music. Furthermore, utilizing PWM weare creating tones for individual piano tones.

C.SD Card Reader

Here we are utilizing SD-card peruser which is connected through SPI correspondence to peruse the .wav recordfrom the SD-card and play it individually from the 5W speaker joined to the DAC of the Arduino.

D.Arduino Tool: ARDUINO is the open-source Arduino climate permits client to compose code and transfer it to the I/O board. The climate is written in Java. The Arduino improvement climate contains a content tool for composing code, message region, message console, and toolbar with buttons for normal capabilities, and a progression of menus. It interfaces with the Arduino equipment to transfer programs and speak with them. Arduino programs are composed in C or C++. Arduino highlights, equipped for gathering and transferring projects to the Board with a solitary snap.Programming composed utilizing Arduino is called outlines. These portrayals are written in the content manager. Draws are saved with the record augmentation „.ino.‟ It has highlights for cutting/gluing and for looking/supplanting text. The message region gives input while saving and sending out and furthermore shows blunders. The control center presentations message yield by the Arduino climate including total blunder messages and other data. The base right-hand corner of the window shows the ongoing board and sequential port. The toolbar buttons permit you to check and transfer programs, make, open, and save portrays, and open the chronic screen. As the Arduino stage utilizes Atmel microcontrollers, Atmel's advancement climate, AVR Studio or the more up to date Atmel Studio, may likewise be utilized to foster programming for the Arduino.

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IV.DEVELOPMENTAL AND EXECUTION STEPS

A. DEVELOPMENTAL STEPS

Step1: Nonstop read the capacitance values from the tins utilizing ADC and Clock mode.
Step2: Comprising two modes utilizing status variable to ascertain Di-electric, if „d" instructed from the client or fill in for what it's worth of piano-tone age mode in default.

Step3: Presently giving as far as possible to each case adjust unit test and start to finish tests essentially set the values.

Setp4: After this we can see that contacting to bottle which goes about as a switch will give the tone and tasting the fluid from the tin which shifts the dielectric makes .wav document playing from the sd-card put away

B. EXECUTION STEPS

Step1: Associate the USB link to PC comprises of terminal for activity.
Step2: Open the terminal utilizing arduino IDE and work the framework by giving orders as „d" to di-electric
mode and „u" for ordinary mode.
Step3: In ordinary mode contact any tin which gives a tone.
Step4: Presently working the framework in dielectric mode taste a portion of the fluid which shifts the dielectric and plays music by means of the speaker appended to the DAC through 555 time based intensifier.
Fig.2 shows flowchart of the system.

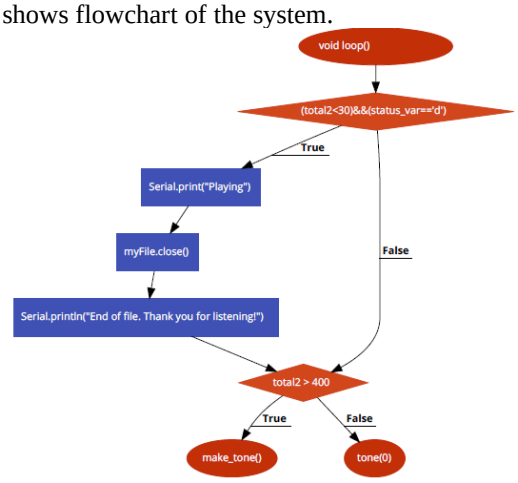

Fig.2.Flowchart of Process

Fig.3 shows the protype of the system.

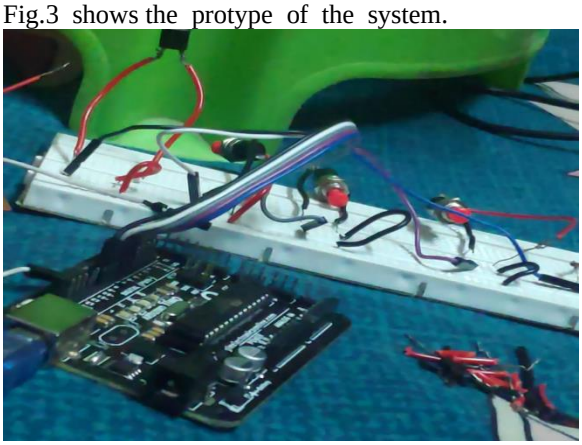

Fig.3. Prototype of the system

V.CONCLUSION

In this paper we hence examined to work with capacitance which goes about as a switch comprising bottle as aplate and human finger as a releasing plate, when contact brings about delivering tone utilizing 555 clock based speaker and we can make applications utilizing dielectric change, which can be made while tasting fluid in tin, what's more, brings about playing a music from the put away media, for example, SD-card

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