CAPACITIVE TINS PIANO CUM MUSIC PLAYER ON ARDUINO

V. Pawan Kumar (Student)
Department of Electronics and Communication
Khammam Institute of Engineering and technology,
Khammam

A. Sudheer Kumar, (Senior Engineer)
Department of Automation and development ,
Prayog Labs pvt ltd,
Hyderabad

Abstract: In this project we are constructing an electronic music player cum piano using coke tins as user inputs for playing. The coke tins here acting as a capacitive switches. The capacitor which has two fundamental properties i.e., Charge and discharge acts as a switch states and change in di-electric results change in charge results in providing different analog voltage. Thus based on this analog voltages we thus can play different music results of music player and switch state results in generating different piano tones for different switches.

After this fundamental principle of working, in order to construct the capacitor we are using human touch circuit by trig and input electric fields. Also after input sensor construction, the output tone generation using piano tone generator based on timer and PWM frequency generation. Then we are using an SD-Card which stores the tracks can be played back using reader and converting those SD format to digital and digital to analog again using DAC. Thus we can thus achieve piano tones based on switching states and music player based on the dielectric variation.

Index Terms: Capacitive Switch, SD-Card, DAC, piano tones.

I. INTRODUCTION

Playing music instruments will bring lots of joy and satisfaction, however not all aspects of music observe music observe are invariably pleasant. During this contribution we tend to are addressing such typically unwelcome aspects: the solitude of active and therefore the "dumbness" of instruments. The method of active and mastering of music instruments usually takes place behind closed doors. A student of piano spends most of her time alone with the piano. Sounds of her enjoying drift, and she or he can't invariably get feedback from friends, teachers, or, most significantly, random web users. Analysing her active sessions is additionally challenging. The technical risk to record herself and place recordings on-line is, however the required effort iscomparatively high, andthen one will it solely often, if at all. Instruments themselves typically don't exhibit any signs of intelligence. They're much mechanic devices, even onceenforced digitally. typically they react solely to direct actions of a player, and therefore the player is exclusivelyliable for the music initiating of the insturment and its quality. there's no middle ground between passive paying attention to music recordings associated active-music creating for somebody World Health Organization is alone with an instrument. Output tone generation using piano tone generator based on timer and PWM frequency generation. Then we are using an SD-Card which stores the tracks can be played back using reader and converting those SD format to digital and digital to analog again using DAC.

Highlight a section that you want to designate with a certain style, and then select the appropriate name on the style menu. The style will adjust your fonts and line spacing. **Do not change the font sizes or line spacing to squeeze more text into a limited number of pages.** Use italics for emphasis; do not underline.

II. BLOCK DIAGRAM

Here is the block diagram which helps in understanding the working of the system, As explained in this application we have two phases:
1. Music piano system,
2. Music player system

1). Music piano system: In this system the coke tins will act as a piano switches and thus produces different sounds for different tins touch.

2) Music player system: The system can be switched to this mode by providing a command to the system as 'd' which we made in application, then change in dielectric of the coke tin nothing but change in liquid level of the coke tin provides different music.
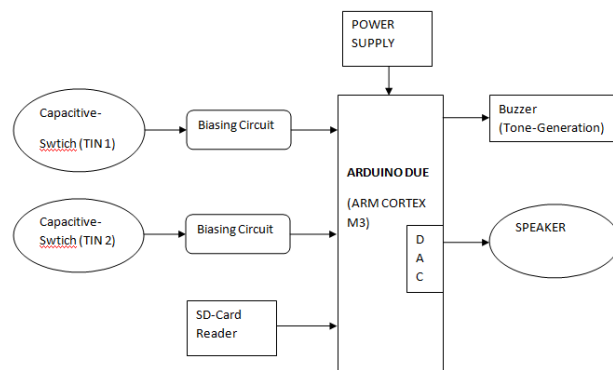

Fig 1. Block diagram of the system

The system here consists of arduino which continuously reads the capacitance values of coke tins and performs the task according to the command provided from the user.

III. TECHNOLOGY DEVELOPMENT PRINCIPLES AND MODULES

The basic principle behind our methodology of bit sensing is that every piano "key" is device that may live the electrical capacitance of an individual's body. The measuring can modification because the user gets nearer to the device and can spike dramatically once the user touches the device. The Arduino are going to be craving for these spikes so as to notice once the user has touched the key. We will ought to use one pin associate degree the Arduino for every key as associate degree "input pin", and we'll would like one pin total to be used because the "common send" pin. we are going to additionally would like one pin for the buzzer which will be accustomed generate a tone. this implies that since associate degree Arduino one has twenty input pins (14 digital and vi analog), we will have up to eighteen keys on our keyboard! If you've got associate degree Arduino Mega or the other board with a lot of pins, that range will be even higher!

A. Capacitor Switch principle

Capacitive sensors can directly sense a variety of things: motion, chemical composition, electric field and, indirectly, sense many other variables which can be converted into motion or dielectric constant, such as pressure, acceleration, fluid level, and fluid composition. They are built with conductive sensing electrodes in a dielectric, with excitation voltages on the order of five volts and detection circuits which turn a capacitance variation into a voltage, frequency,
or pulse width variation.

Capacitive sensors have a wide variety of uses. Some are
• Flow--Many types of flow meters convert flow to pressure or displacement, using an orifice for volume flow or Coriolis effect force for mass flow. Capacitive sensors can then measure the displacement.
• Pressure--A diaphragm with stable deflection properties can measure pressure with a spacing-sensitive detector.
• Liquid level --Capacitive liquid level detectors sense the liquid level in a reservoir by measuring changes in capacitance between conducting plates which are
immersed in the liquid, or applied to the outside of a non-conducting tank.
• Spacing--If a metal object is near a capacitor electrode, the mutual capacitance is a very sensitive measure of spacing.
• Scanned multi-plate sensor--The single-plate spacing measurement can be extended to contour measurement by using many plates, each separately addressed. Both conductive and dielectric surfaces can be measured.
• Thickness measurement--Two plates in contact with an insulator will measure the insulator thickness if its dielectric constant is known, or the dielectric constant if the thickness is known.
• Ice detector--Airplane wing icing can be detected using insulated metal strips in wing leading edges.
• Shaft angle or linear position--Capacitive sensors can measure angle or position with a multiplate scheme giving high accuracy and digital output, or with an analog output with less absolute accuracy but faster response and simpler circuitry.

• Lamp dimmer switch--The common metal-plate soft-touch lamp dimmer uses 60Hz excitation and senses the capacitance to a human body.

• Key-switch--Capacitive key switches use the shielding effect of a nearby finger or a moving conductive plunger to interrupt the coupling between two small plates.

• Limit switch--Limit switches can detect the proximity of a metal machine component as an increase in capacitance, or the proximity of a plastic component

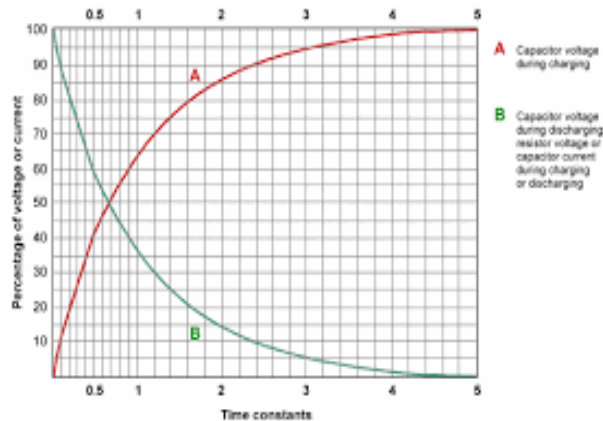• Coke tin Switches: These coke tin switches will behave as shown in characteristics below:

Fig 2.Characteristics of capacitance curve of arduino

B. Arduino Due

Arduino Due is the ARM cortex M3 architecture based controller consists of internal,16PWM's, 2UART, 2I2C, 2DAC, 16ADC, 13GPIO's and is a 32-bit architecture, having 70Mhz clock.
Using SPI internal we are reading the wav file stored in SD-micro card and play the music. And using PWM we are generating tones for respective piano tones.

C. SD-card Reader:

Here we are using SD-card reader which is interfaced through SPI communication to read the .wav file from the SD-card and play it respectively from the 5W speaker attached to the DAC of the arduino.

D. Arduino Tool:

ARDUINO is the open-source Arduino environment allows user to write code and upload it to the I/O board. The environment is written in Java. The Arduino development environment contains a text editor for writing code, message area, text console, and toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. Arduino programs are written in C or C++. Arduino features, capable of compiling and uploading programs to the Board with a single click. Software written using Arduino is called sketches. These sketches are written in the text editor. Sketches are saved with the file extension ,,.ino." It has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino environment including complete error messages and other information. The bottom right-hand corner of the window displays the current board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. As the Arduino platform uses Atmel microcontrollers, Atmel's development environment, AVR Studio or the newer Atmel Studio, may also be used to develop software for the Arduino.

IV. EXECUTION STEPS-ALGORITHM

A. Development algorithm:

Step1: Continuous read the capacitance values from the tins using ADC and Timer mode.

Step2: Consisting two modes using status variable to calculate Di-electric, if 'd' commanded from the user or work as it is of piano- tone generation mode in default.

Step3: Now providing the threshold limits for each case modify unit test and end to end tests practically set the values.

Setp4: After this we can observe that touching to bottle which acts as a switch will provide the tone and sipping the liquid from the tin which varies the dielectric makes .wav file playing from the sd-card stored.

B. Execution process:

Step1: Connect the USB cable to laptop consists of terminal for operation.

Step2: Open the terminal using arduino IDE and operate the system by providing commands as 'd' for di-electric mode and 'u' for normal mode.

Step3: In normal mode touch any tin which provides a tone.

Step4: Now operating the system in dielectric mode sip some of the liquid which varies the dielectric and plays music via the speaker attached to the DAC through 555 time based amplifier.

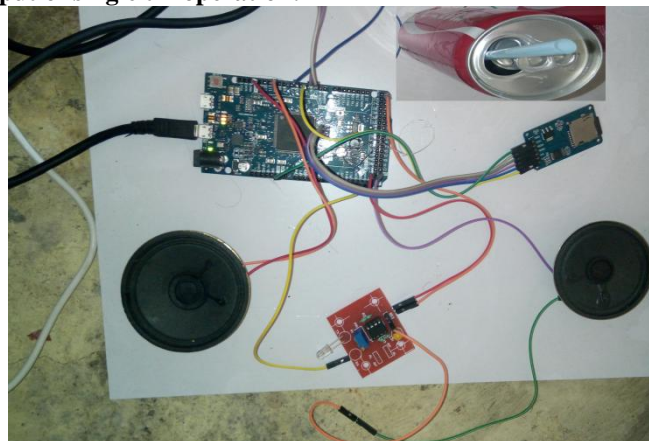**C. Flow chart and Output of single tin operation:**
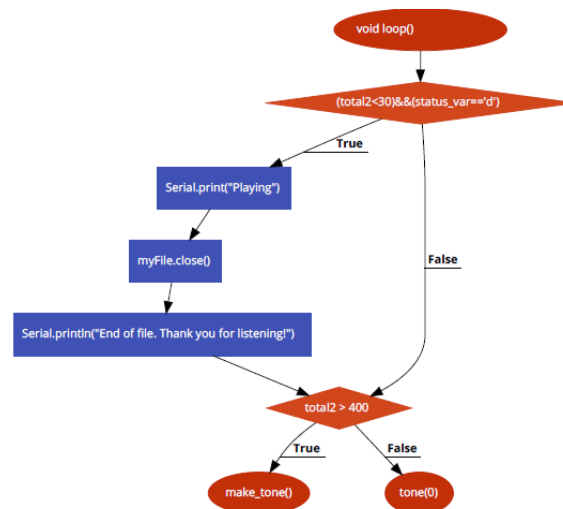

Fig 3. Respective output

Fig 4. Flow chart of the system operation

V. TROUBLE SHOOTINGS

While setting up the system coke tins were attached using wires attaching to them using gum stick, need to take care regarding while attaching which results in variation and causes change in system functionality as threshold limit cannot reach.

Also make sure the usb plugged in and choosing the board selection in arduino ide as "Tools-> COM16(USB Arduino Due)" for commanding the system for working mode.

VI. CONCLUSION

In this paper we thus discussed to work with capacitance which acts as a switch consisting bottle as a plate and human finger as a discharging plate, when touch results in producing tone using 555 timer based amplifier and we can make applications using dielectric change, which can be made when sipping liquid in tin, and results in playing a music from the stored media such as SD-card.

REFERENCES

[1]. Dan Mihai stefanescu, "Hand book of transducers",
[2]. York: Springer-Ch5.
[3]. H. Poor, *An Introduction to Signal Detection and Estimation*. New York: Springer-Verlag, 1985, ch. 4.
[4]. Prayog Labs pvt ltd –(Reasearch lab), Hyderabad.
[5]. Arduino Development Environment, http://arduino.cc/en/guide/Environment
[6]. Arduino IDE, http://arduino.cc/en/main/software
[7]. SAM3U Cortex M3 controller datasheet,
http://www.atmel.com/products/microcontrollers/ARM/SAM3U.aspx

V.Pawan Kumar, student pursuing Masters in Smbedded Systems from Department of Electronics and Communication in Khammam Institute of Engineering and technology, Khammam. Having research on capacitors principle made the thesis proposed in this paper.

A. Sudheer Kumar, working as a senior engineer, Master in Embedded Systems from JNTU 2015, present working at prayog labs pvt ltd, Hyderabad in Department of Automation and development. Proposing this thesis of paper by music system development.