Light Activating Sound Detecting Switch

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Abstract --- A "Clap Switch" is an interesting concept that could be used in home automation. In this paper, we present idea to control Electrical Home Appliance like light, TVs, Fans, Bulb, etc. using clap. In order to save time as much as possible, the concept of clap switch is done. The main components of the circuit is the sound sensor. Sound sensor converts the sound sensor into electrical energy and it is send to the Arduino Uno which process the information. The information is then transferred to the relay as a key for better operation. The relay then turns ON and OFF the Lamp according to the given code by the Arduino Uno.
Keywords: Tmega 8 micro controller, Sound Sensor, Relay

I. INTRODUCTION

In the current revolution of digital world, people like convenience in using technology to make their life more easy and comfortable.

People feels to control their home appliances like light, fan etc in more convenient way rather than by switch board as they must walk across the room to either on or off such appliances.Now a day's various methods are available for controlling devices. Those methods used for wired and wireless technology for the purpose and each technology have its own advantages and disadvantages. This is a project on CLAP SWITCH which can switch on/off any electrical circuit by the sound of a clap. The operation of the circuit is simple. The lamp turns ON and OFF according to the consequent claps. The main advantage of this technology is that it is mainly helpful for a mobility-impaired person. The condenser mic and the sound sensor is one of the main components in the circuit that tracks the input clap sound based on the clap and transduces the sound energy into some electric pulses. These electric pulses are the desired input to the clap switch circuit.This circuit is mainly based on the the aurdino uno and the sound sensor for the sound detection. Clapping hands basically produce about 2200 to2800 hz range and the total time taken for outcome from the circuit will be up to 3seconds in maximum.This "Clap Switch" circuit uses a microphone within the sound sensor to detect noises to turn the LED on. A clap switch circuit can be used in homes and businesses to turn on things such as: lights, TVs, or whatever it is set up to the clap switch. In many cases you can snap your fingers, clap your hands, or even speak to it.In fact, with modern technology, you can use commands to activate a piece/pieces of technology to allow it to turn on/off from anywhere within the room of the Clap Switch.Individuals will construct a Clap Switch circuit and gain based knowledge on the Aurdino uno, coding, sound sensor and the condenser microphone. Also, individuals will get to see exactly how you can turn things on by a simply clap, nap, and/or the use of the voice.

II. LITERATURE REVIEW

Various reviews had been held on clap switch techniques and notable ones are explaned below: "Control Of Home Amenities Using Google Assistant And Clap Switch Circuit" by Vanith.K.Lalitha, B.Mahalakshmi, S.Madhusudan, M.Srinivasaperumal, S.Srikanth of IEEE(2021) explains that this peerless home automation system is distinctive from the other existing system which has been implemented formerly. Either a planned out microcontroller or a switching circuit is used to regulate the household devices. This system primarily focuses on the combination of switching circuit and the google assistant which is an artificial intelligence powered virtual assistance. "Design of a 9 way clap switch circuit" by Kirabo, Perez Muyanja(2021) explains that This is a 9 way clap switch circuit as one of the assistive technologies which can enable mobility impaired people switch ON and OFF electrical appliances without moving off their chairs. "Analysing Efficiency and Effectiveness of Clap Switch Mechanism" by Biradar, Shant KumarBadi, Manjulata of HBRP Publication(2021)explains that , the electronic circuit initiated or activated by outside sound resembling applause sounds occurs at 2200Hz to 2800Hz within. This was directed from the different NE 555 Clap Switches and Arduino Clap Switch. The NE 555 based clapping switch is probably the most cost-effective way for micro controller based clapping controls. The device and Construction of Clap Switch" by Hakim Kizito of Makerere University(2022) explains that In this circuit to switch on the load. It uses condenser mic to get the sound signal, transistors to amplify weak signal, capacitors and resistors as timer to switch ON by electrical signals.

"Design of clap detection light control system based on Arduino Uno" by Kesadaran Luaha, Syahlan Ismail, Arif Rahman, Nurhawa Nizar Siagian, Laily Rizky Amalia, Rian Farta Wijaya(2023) explains that In making it the author uses the Arduino Uno microcontroller as the brain of this system, sound sensor works based on

incoming sound waves. If the sound waves hit the sensor membrane, it will have an effect on the sensor membrane vibrating. The membrane will convert sound waves into electrical quantities which can later be used as parameters to control output devices.

III. CIRCUIT COMPONENTS:

ARDUINO:-

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

It is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button

SOUND SENSOR:-

Figure 1 - Sound Sensor

Sound sensor is defined as a module that detects sound waves through its intensity and converting it to electrical signals. They are used in audio recording, noise pollution monitors, and acoustic detectors. The main components int the sound sensor is the mic. The SI unit of sound is Decibel which is abbreviated by dB It effectively detects the noise levels at a frequency range of approximately 3kHz to 6kHz.

The Op – amp comparator comapres one analogue voltage level with another analogue voltage level,or some preset reference voltage. It helps in detecting high and low voltage w.r.t the refernce signal.

The microphone gives out analog signals when a sound wave hits the diaphragram of the sensor,this analog signal gets processed by the op –am and we get the ouput. The sound led turns on when the circuit is triggered by any form of vibration like our clap,snap. The power led turns on when the power is applied to the sound sensor. The Trim pot adjust sensitivity is nothing but a 10k resistor used to set the sensitivity of the sensor. THE signal can be received clearly by adjusting the knob of the trimmer. The Digital Out pin detects the level of output received in the mic. If low output is obtained,it indicated no sound is detected and high is obtained,it indicated that the sensor has detected a sound.After detecting it sends the output to the arduino board. Voltage Collector Current(Vcc) pin gives the power supply to the sound sensor board and also it is the positive power supply terminal.GND pin is for the ground connection.

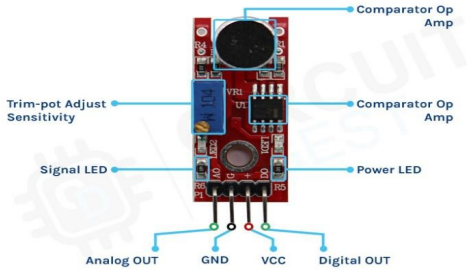


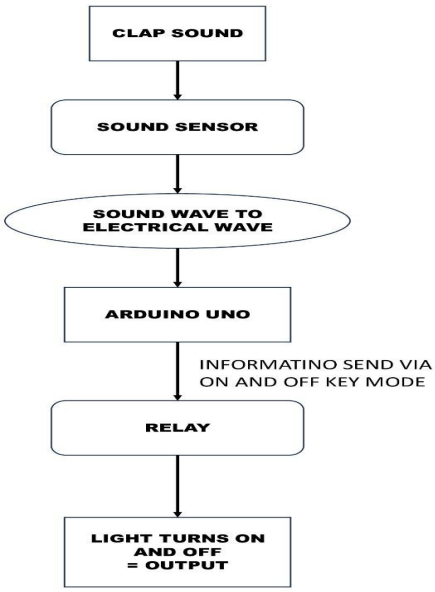
Figure 2 – Sound Sensor Pin Diagram

RELAY:-

Figure 3 - Relay

The arduino code provided controls the relay based on the sound intensity detected by the sound sensor.The relay contacts ultimately goes to a load or an appliance which correspondingly switched ON an OFF with every subsequent claps.Vcc: It gives the power supply to the board. GND: It is the ground connection.
Input: Gets input from the Arduino board as a key to turn ON and OFF.

IV. BLOCK DIAGRAM FOR PROPOSED SYSTEM



V. BLOCK DIAGRAM FOR PROPOSED SYSTEM

The Arduino uno is used for this project for the transferring the information from the sound sensor to the relay

and to make easy mode of ON and OFF. Here we use the AT mega 8 microcontroller in the Arduino Uno –a single chip and it is also termed as a control device.Similar to a computer, the Microcontroller is made with a variety of peripherals like input & output units, memory, Timers, serial data communications, programmable.

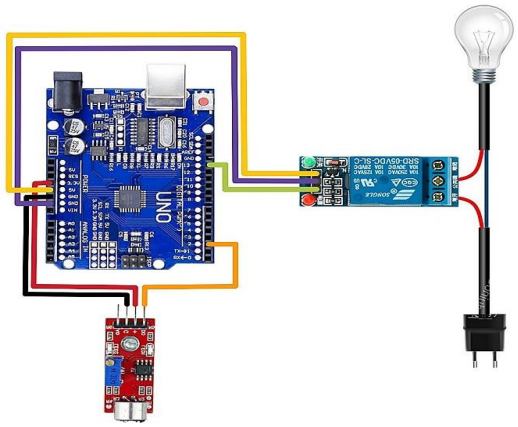


Figure 5 – Circuit Diagram

VI. CONCEPTUAL DIAGRAM AND WORK FLOW:

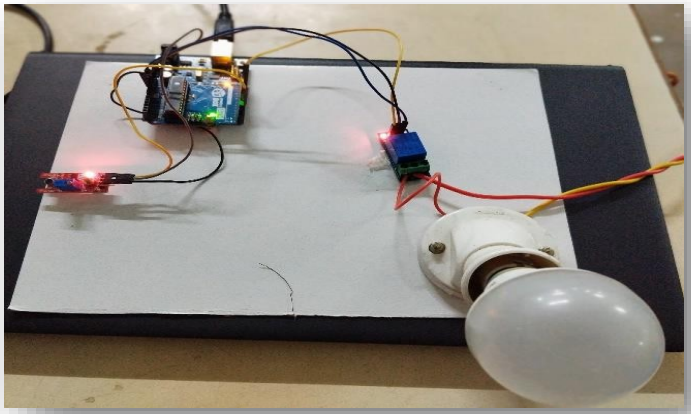
First the Connection is given from Arduino pin 3 to the digital output pin on the sound sensor for data communication. The Vcc of the sound sensor is linked to Arduino's 5V pin for power supply. The ground of the sound sensor is connected to the ground pin on the Arduino. And for the Relay the connections are given as 1. The Input to Arduino pin 12. The Vcc to the positive (5V) on the Arduino. And The Ground pin of the relay the Arduino ground. Then Connection of the lamp phase is to the normally open (N.O.) terminal of the relay. The phase of the power supply is connected to the common terminal of the relay. And the neutral of the power supply to lamp's neutral. At last a separate Arduino cable for AC supply, ensuring it aligns with the programming requirements.

This circuit appears to be a simple home automation setup. The sound sensor, connected to Arduino pin 3, detects sound signals. When sound is detected, the Arduino processes this information. If programmed to do so, it activates the relay connected to pin
12.The relay, in turn, controls the lamp. When the relay is triggered (perhaps due to the sound detected by the sensor), it switches the lamp on by closing the circuit between the common and normally open (N.O.) terminals.In summary, the circuit allows the Arduino to control a lamp based on sound input from the connected sensor, providing a basic form of sound-activated home automation. The separate Arduino cable ensures the device receives the necessary power for both programming and operation.

VII. DESCRIPTION OF THE CODE USED:

This Arduino program utilizes a digital sensor connected to pin 3 (`sensor`) and an LED connected to pin 12 (`led`). The variable `is_on` is a boolean flag indicating whether the LED is currently on or off.In the `setup` function, it configures pin 3 as an input for the sensor and pin 12 as an output for the LED.The `loop` function continuously reads the digital state of the sensor using `digitalRead(sensor)`. If the sensor detects a high signal (1), it checks the state of `is_on`. If the LED is currently on (`is_on == true`), it turns it off and updates the `is_on` flag. If the LED is off, it turns it on and updates the flag accordingly.In summary, this program toggles the LED state each time the sensor detects a high signal, effectively creating a simple on/off switch behavior based on the sensor input.

VIII. RESULT ANALYSIS AND DISCUSSION:



XI.CONCLUSION

In conclusion, the clap switch with Arduino Uno stands as a compelling example of the fusion between simple user interaction and versatile microcontroller capabilities. By translating clapping sounds into actionable commands, this project offers a hands-free and engaging solution for controlling electronic devices. The accessibility and adaptability of Arduino Uno make this project not only functional but also a valuable educational tool, providing enthusiasts with an entry point into the realms of electronics and programming. As a creative and interactive technology, the clap switch underscores the potential for user-friendly innovations within the broader landscape of DIY electronics

It has various future scope in the following fields like Smart Home Appliances and Automation, Energy Efficiency, Healthcare Applications, Industrial Applications, Integration with Voice Assistance, Machine Learning Integration, For Educational Tools, In Wearable technology, Integration with IOT, Accessibility Feasibility.

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