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Submission Due on :	01st March 2022
Type of Coursework:	Group
Title of the Coursework:	Clap Control Home Automation

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NATIONAL INSTITUTE OF BUSINESS MANAGEMENT
DIPLOMA IN SOFTWARE ENGINEERING/DIPLOMA IN NETWORK ENGINEERING
COURSEWORK ONE

ELECTRONICS AND COMPUTER ARCHITECTURE

Clap Control Home Automation

SUBMITTED BY

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Date of Submission: …10/03/2022……..

DECLARATION

This project is an original work presented in partial fulfillment of the Coursework for the Electronics and Computer Architecture module followed by the diploma in software Engineering NIBM and the literature diagrams quoted in this project is not included without the due mention of the original author. We hereby declare that the proposal assignment submitted is explicitly acknowledged by all the members of the group and have read and checked all the parts of the piece of work.

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SUMMARY

Nowadays people act as busy bees and stick to their daily routines and chores, at a time like that the invention of the clap control home automation makes people's busy lives even more comfortable and tranquil. This proposal outlines a plan where Clap switch circuits play an important part in today's home automation control circuitry, as it ventures into the domain of dynamic control of home appliances using a simple sound signal like a clap. This circuit is helpful for the consumers if they wish to turn on and off the device or electrical appliances through claps without moving from your place. Moreover, the other use is that there is no risk of electrical shocks as there is no necessity of touching the mechanical switches physically. The basic idea of the clap switch is that the electric microphone picks up the sound of the claps and produces a small electrical signal which is amplified by the succeeding transistor stage.

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CHAPTER 01

1.1 Introduction

A circuited switch, which operates with the sound of clapping hands, where the switch comes to ‘on’ position when clapped once or twice and to ‘off’ position when again clapped once or twice. Furthermore, A clap-switch circuit is a sound-sensitive circuit. The operation of the circuit is simple. Clap and the lamp turn on. Clap again and it turns off. This circuit is constructed using basic electronic components like resistors, transistors, capacitors, etc. The condenser microphone picks up the sound of your claps. It produces a small electrical signal which is amplified by the succeeding transistor stage. Two transistors are cross-connected as a bistable multivibrator change state at each signal. One of these transistors drives a heavier transistor that controls a lamp. This circuit can switch on and off a light or any electric appliance by the sound of a clap. This working of this circuit is based on amplifying nature of the transistor, the switching nature of the transistor, relay as an electronic switch. The LED on-time can be varied by changing the value of the capacitor (100mF). When the capacitor value is changed from 100 mF to 10mF, the LED on-time is decreased. Your clap should be loud, you can blow air from your mouth on the electric condenser to turn on the LED.

1.2 Features of the Product

- The main benefit of clap switch is, we can control any electric load like light, a fan from any place in the room by just clapping our hands.
- It provides good output efficiency.
- It is an advantageous technology for mobility-impaired person
- Automatically controls lights within a specified range by clapping action
- Energy efficient
- Low cost
- Reliable circuit
- Complete elimination of manpower
- High Accuracy

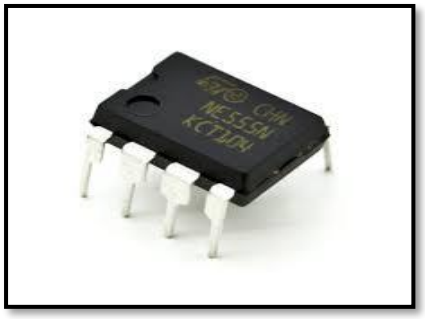
CHAPTER 02

2.1 Circuit Components

i. Condenser Mic

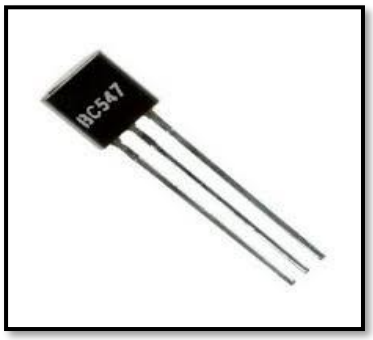
- Condenser Microphone is similar to an Amplifier. It is an acoustic-to-electric transducer or sensor that converts sound into an electrical signal.

ii. 555 Timer IC



- IC 555 timer is used for the timing function, such as turning the LED on for a short period, and also it is used in a variety of timer, pulse generation, and oscillator applications. It can be used to provide time delays, as oscillators and as flip-flop elements.

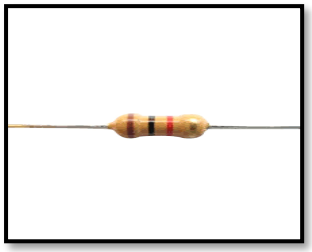
iii. Transistor BC547



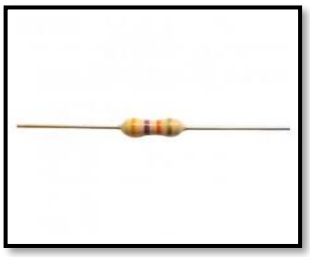
- BC547 is usually used for a current amplifier, quick switching, and pulse-width modulation (PWM).

iv. Resistors (1k, 47k, 100k ohm)

a. 1k ohm Resistor



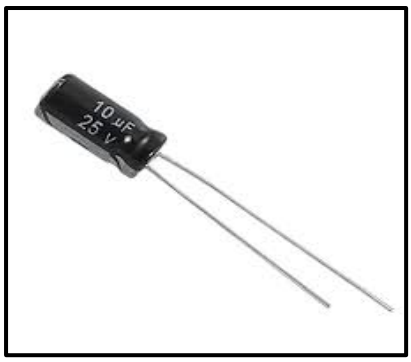
b. 47k ohm Resistor



c. 100k ohm Resistor

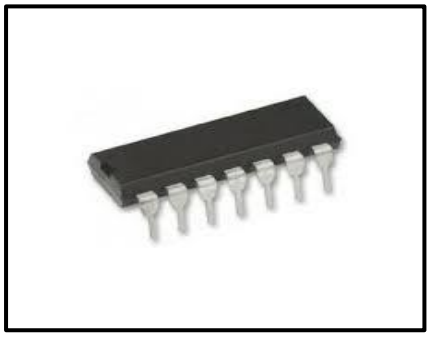
- They are electric components that oppose the flow of current or prevent excess leakage of current in the circuit when required.

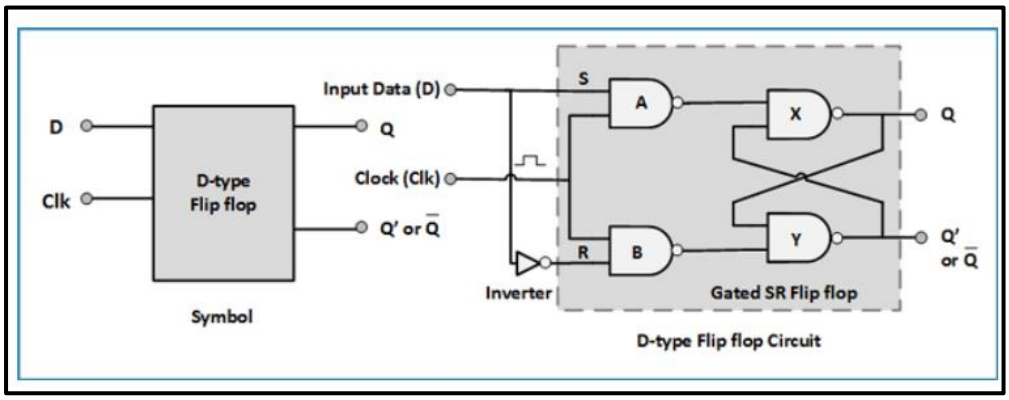
v. Capacitor (10uF)



- Capacitors – They are passive components that store a small amount of charge. These devices stores electrical energy in an electric field. These passive electronic components are composed of two terminals.

vi. IC7474 more precisely DM74S74N (D-type flip flop)





- The 7474 is an edge-triggered device. This device contains two independent positive-edge-triggered D-type flip-flops with complementary outputs. this flip flop only responds when the clock pulse would go from LOW to HIGH.

- IC DM74S74N is the Dual D-type Flip-flop IC, in which there are two D-type Flip-flops, which can be either used individually or as a master-slave toggle combination. We are using one D-type Flip-flop in our circuit. Pins for the first D flip-flop are on the left side and for the second flip flop are on the right side. Also, there are PRE and CLR pins for both the D-type Flip-flops which are active-low pins. These pins are used to SET or RESET the D-type Flip-flop respectively, regardless of INPUT D and Clock. We have connected both to Vcc to make them inactive.

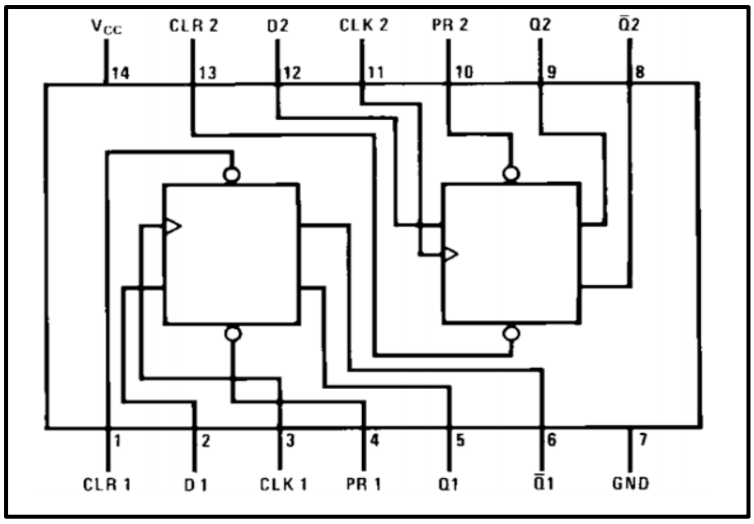
vii. LED and Battery (5-9v)

- Battery provides power and it stores energy and then discharges it by converting chemical energy into electricity.
- LED is used to radiate light when power is supplied.

2.2 Truth Tables

Deducing the Truth Table of the D Flip-Flop:

Here we are using a Positive Edge Triggered D-type flip-flop, which means this flip flop only responds when the clock pulse would go from LOW to HIGH. OUTPUT Q will be shown according to the state of INPUT D, at the time of the Clock pulse transition (Low to High). Flip flop remembers this OUTPUT state Q (Either HIGH or LOW), until the next positive clock pulse (Low to High). And again, shows the OUPUT Q, according to the input state D, at the time of clock pulse transition (LOW to HIGH)



When we first triggered the 555 IC by the first Clap, the LED glows as we get Q=1 and Q'=0. And it will remain ON until the next trigger or next positive clock pulse (LOW to HIGH). We have connected Q' to INPUT D, so when LED is glowing, Q'=0 is waiting for Second Clock pulse, so that it can be applied to the INPUT D and makes Q=0 and Q'=1, which in turns TURN OFF the LED. Now Q'=1 is waiting for the next clock pulse to make the LED turn ON by applying Q'=1 to INPUT D, and so on this process will continue.

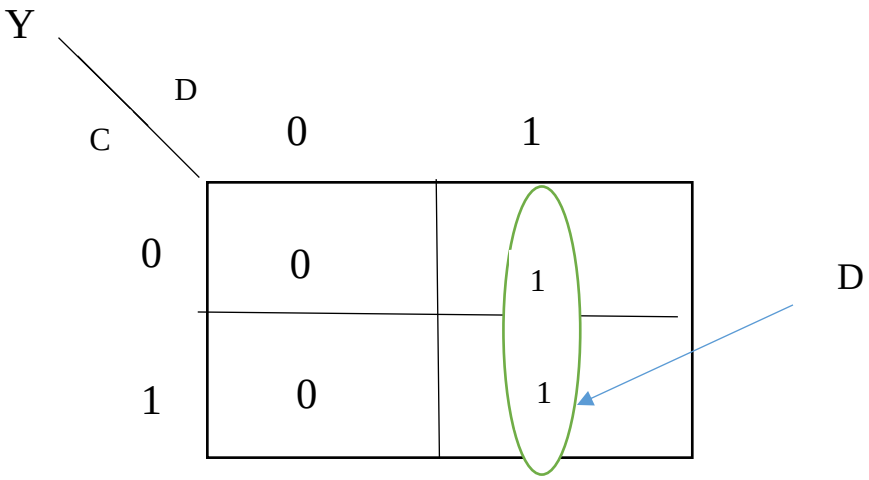
Clk	D	Q	Q'	Description
↓ » 0	X	Q	Q'	Memory no change
↑ » 1	0	0	1	Reset Q » 0
↑ » 1	1	1	0	Set Q » 1

For Further understanding about truth tables:

Clock Signal	D	Q
0	0	0
0	1	1
1	0	0
1	1	1

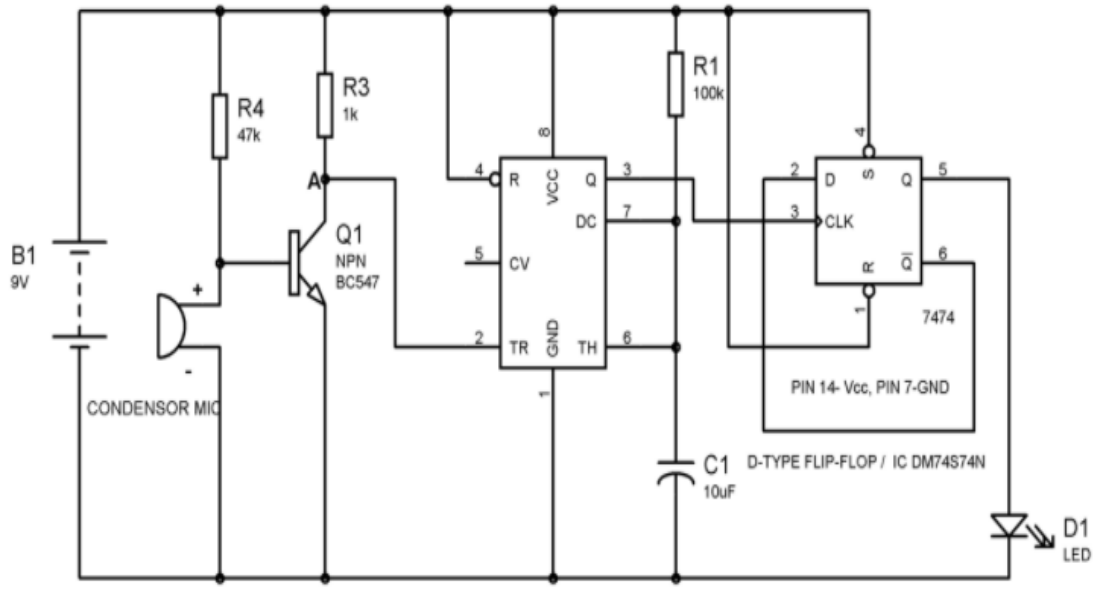
2.3 K Maps

Let’s take the input of the clock signal by the given truth tables as ‘C’:



Y=D

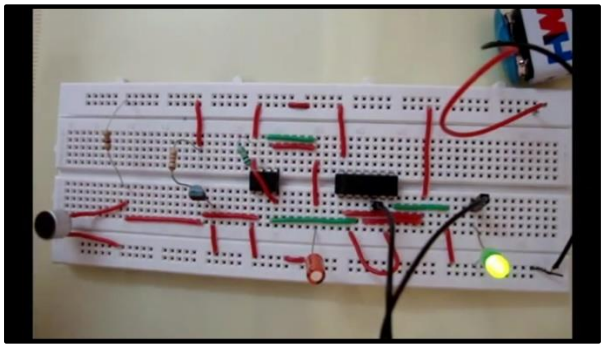
2.4 Circuit Diagrams



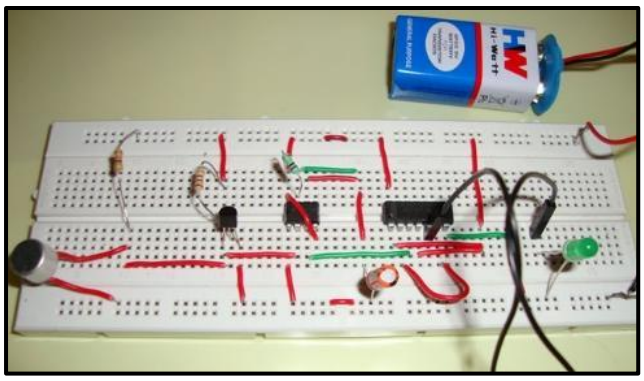
CHAPTER 03

3.1 Results of the operation

- When the clap sound is detected by the circuit (Microphone):



- When the clap sound is not detected by the circuit (Microphone):



Working of the Circuit:

Here we are using Electric Condenser Mic for sensing the sound, transistor to trigger the 555 timer IC, 555 IC to SET & RESET the D-type flip flop and D-type flip flop to remember the logic level (LED ON or OFF) until next Clap/sound.

CHAPTER 04

4.1 Limitations, Recommendations, and Conclusion

Limitations

- No filter has been used here so the switch will respond to more or less every two sounds similar to clapping.
- We need to clap loudly to test this circuit as this small condenser mic doesn’t have a long range.
- No relay is been used here.
- External sounds similar to the sound of clapping may also make the circuit work.

Recommendations

- If a relay is used, we can extend the circuit to connect further devices for further usage of the clap switch.
- But if a simple bandpass filter is used then the above-mentioned problem could be avoided.
- The frequency range of hand-clapping is between 2200 and 2800 Hertz. Therefore, to add more sensitivity to the switch, the sensitivity of the microphone may be increased. For this, we can use a proper value of Pull-Up resistor with the mic or use a variable resistor and try different values or use different microphones.

Conclusion

This circuit is very useful in the field of electronic circuits. Using some modifications its area of application can be extended in various fields. It can be used to raised alarms in a security system with noise, and also used at the place where silence is needed. This project gives us a great deal of knowledge about the 555 timer chips, the working of clocks, and the relay. This type of device provides us with the working of NE555 timer chips and the relay. The relay is a type of switch which provides a conducting path only when current flows it. In this project as soon as the 2nd timer triggers the relay a conducting path is established between terminals of the load and hence the device is turned on. This switch is very low cost and is very useful

to the elderly and physically challenged people. However, the major disadvantage of this switch is false triggering. The switch can be triggered by any two sounds similar to that of hands clapping. So good care has to be taken to avoid this kind of false triggering and the switch should not be used in very sensible applications. It is only for home uses. Nevertheless, it is an excellent example of electronics evolution and how engineering and electronics have made our life easier. In the future, this system or technique will be helpful in every industry in every aspect.

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v. https://www.youtube.com/watch?v=pSFkiqtGgjs
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viii. https://circuitdigest.com/electronic-circuits/clap-switch-project

APPENDIX

Component	Quantity
Condenser Microphone	1
555 Timer IC	1
Transistor BC547	1
Resistor 1k ohm	1
47k ohm	1
100k ohm	1
Capacitor 10uF	1
DM74S74N (D-type flip flop)	1
LED	1
Battery	1