CLAP SWITCH HOME AUTOMATION

A

Real Time Project/ Field Based Project

Submitted in the Partial Fulfillment of the Academic Requirements for the

Award of the Degree of

Bachelor of Technology

In

Electronics and Communication Engineering

By

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(An UGC Autonomous Institution)

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Accredited by NBA & NAAC 'A' Grade Ankushapur (V), Ghatkesar

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2023-24

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CERTIFICATE

This is to certify that the Real Time Project/ Field Based Project entitled

"CLAP SWITCH HOME AUTOMATION"

done by

E.AMULYA 22AG1A0482

Of Department of **Electronics and Communication Engineering**, is a record of bonafide work carried out by her. This Real Time Project/ Field Based Projectis done as a partial fulfillment of obtaining **Bachelor of Technology Degree** to be awarded by **Jawaharlal Nehru Technological University, Hyderabad, during the academic year 2023-24.**

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ACKNOWLEDGEMENT

I take this opportunity to thank one and all who have helped in making this Real Time Project/ Field Based Project possible. I am thankful to **JNTUH** for giving me this opportunity to work on a project as a part of our curriculum.

I am happy for being guided by **Mr.P.KIRAN KUMAR**, Assistant Professor for his able guidance given to me to complete this Real Time Project / Field Based Project work successfully.

I wish to express my deep sense of gratitude to our Project coordinator **MR.P.SUBRAHMANYAM**, Associate Professor for giving me an opportunity to present the technical project work.

I am grateful to thank **Dr.P.SATISH KUMAR** , Head of the Dept. of ECE, for this thought, provoking suggestions and constant encouragement that led me to this success.

I would like to convey my heart full thanks to **Dr. B. L. RAJU**, Principal of the college for the wonderful guidance and encouragement given to me to move ahead in the execution of this project and **Prof. Y. V. GOPALA KRISHNA MURTHY**, for his moral support and provided facilities.

Above all, I am very much thankful to the management of **ACE Engineering College** which was established by the high-profiled intellectuals for the cause of Technical Education in the modern era.

With regards,

E.AMULYA **22AG1A0482**

CONTENTS

ABSTRACT

This project report outlines the design, implementation, and evaluation of a clap switch, a simple yet innovative electronic device that translates sound into a switching mechanism. The clap switch is a hands-free solution with applications in home automation, security systems, and energy conservation. The primary objective of this project is to create a functional and reliable clap switch using principles of digital logic design. The report begins with an introduction to the concept of clap switches, discussing their relevance and potential applications. A brief literature review provides insights into existing clap switch designs and serves as a foundation for our project. The project's methodology is detailed, covering the selection of components and the construction of the circuit. The report also highlights the challenges encountered during the implementation phase and the strategies employed to overcome them. Results from rigorous testing demonstrate the effectiveness of the clap switch in various environments. The discussion section critically analyzes the project's outcomes, comparing them with existing designs and offering insights into the strengths and limitations of the implemented clap switch. In conclusion, this project contributes to the real/field based project by presenting a functional clap switch prototype.The report suggests potential applications and areas for improvement, paving the way for future research in this domain.

LIST OF THE FIGURES

CHAPTER-1 INTRODUCTION

1.1) Introduction of the project :

A circuited switch, which operates with sound of clapping hands or something similar; i.e. the switch comes to 'on' position when clapped once or twice, and to off' position when again clapped once or twice (depends on circuit design) A clap -switch circuit is a sound sensitive circuit. . The operation of the circuit is simple. Clap and the lamp turns on. Clap again and it turns off. The condenser microphone picks up the sound of your claps, coughs, and the sound of that book knocked off the table. It produces a small electrical signal which is amplified by the succeeding transistor stage. Two transistors cross connected as a bistable multivibrator change state at each signal. One of these transistors drives a heavier transistor which controls a lamp. This circuit can switch on and off a light, a fan or a radio etc by the sound of a clap. This working of this circuit is based on amplifying nature of the transistor, switching nature of transistor, relay as an electronic switch . The LED on-time can be varied by changing the value of the capacitor (100mF). When capacitor value is changed from 100 mF to 10mF, the LED ontime 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) Existing system:

The Clap Switch Home Automation system is designed to enable hands-free control of electrical appliances through the detection of specific sound patterns, typically clapping. It consists of essential components including a microphone or sound sensor, a microcontroller or processor, relays, and the appliances themselves.The system operates by first detecting the sound of clapping through the microphone or sound sensor. When a clap is recognized, the sensor sends a signal to the microcontroller, which processes the input. Based on pre-programmed logic, the microcontroller then triggers the appropriate relay connected to the desired appliance. For instance, one clap might turn on a light, while two claps could turn on a fan, depending on the configuration. Installation involves positioning the microphone or sensor in a central location where it can effectively capture clapping sounds from across the room. The microcontroller is typically programmed to distinguish between intended claps and other background noises to minimize false activations.The system's simplicity and affordability make it accessible for basic home automation needs, providing users with convenience by eliminating the need to physically reach for switches. However, it may be sensitive to other loud noises resembling claps, potentially causing unintended activations.

1.3) Processed system:

The Processed system of Clap Switch Home Automation enhances the traditional setup by integrating advanced features for improved functionality, reliability, and user experience. Here's an overview:

1. Advanced Sound Detection:

- Utilizes sophisticated sound sensors or microphones capable of distinguishing specific clap patterns from background noise. This reduces false triggers and enhances accuracy in detecting user commands.

2. Microcontroller with AI Integration:

- Incorporates a microcontroller enhanced with AI algorithms for more intelligent processing of sound signals. This enables the system to learn and adapt to different clap patterns over time, improving responsiveness and user interaction.

3. Multi-Appliance Control:

- Supports simultaneous control of multiple appliances based on different clap sequences. Users can define custom commands (e.g., three claps to activate all lights) for enhanced convenience and flexibility.

4. Remote Access and Control:

- Integrates with Wi-Fi or Bluetooth connectivity, allowing users to control appliances remotely via smartphone apps or voice assistants. This enables management of home devices from anywhere, adding convenience and security.

5. Energy Monitoring and Optimization:

- Includes energy monitoring features to track power usage of connected appliances. This data helps users optimize energy consumption, contributing to cost savings and environmental sustainability.

6. User Profiles and Customization:

- Supports multiple user profiles with personalized settings and preferences. Each user can configure their own clap sequences and automation rules, tailoring the system to individual needs.

7. Expandability and Integration:

- Easily integrates with existing smart home ecosystems and platforms (e.g., Google Home, Amazon Alexa) for seamless interoperability with other smart devices and automation routines.

8. Enhanced Security Features:

- Implements advanced security protocols to prevent unauthorized access and ensure data privacy, especially important for remote control functionalities.

In conclusion, the Processed Clap Switch Home Automation system represents a significant advancement over traditional models, offering enhanced functionality, usability, and integration with modern smart home environments. It provides users with greater control, efficiency, and convenience in managing their home appliances while promoting energy conservation and improving overall home automation experience.

CHAPTER 2 - COMPONENTS OF PROPOSED SYSTEM

2) COMPONENTS :

2.1) Resistor :

FIG 2.1.1 Resistor

Resistor is a passive element which opposes the flow of current. The resistor values are varied by using the colour coding. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. In electronic circuits resistors are used to limit current flow, to adjust signal levels, bias active elements, terminate transmission lines among other uses. High-power resistors that can dissipate many watts of electrical power as heat nay be used as part 01 motor controls, in power distribution systems, or as test roads for generators. The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance will fall within a manufactures tolerance.

2.2 LED's [Light Emitting Diodes]:

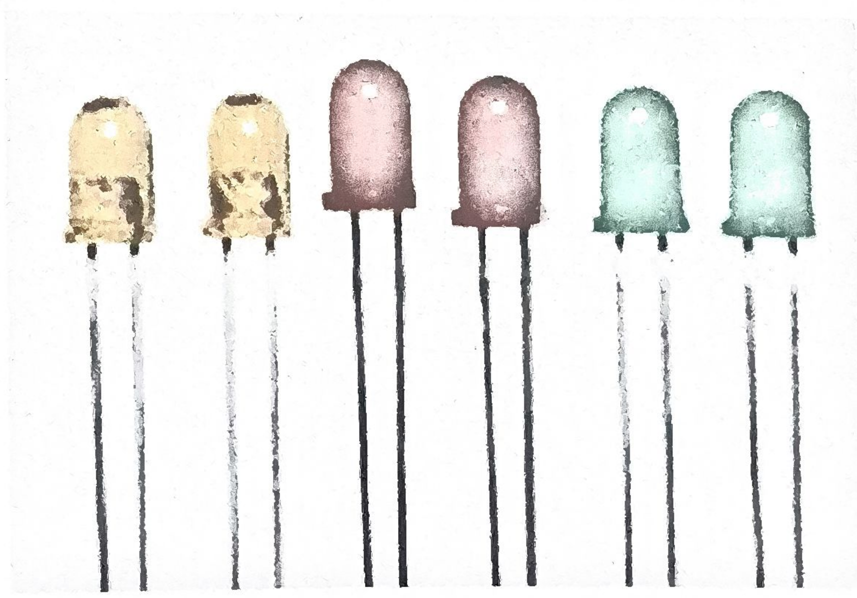

FIG 2.2.2 LED's [Light Emitting Diodes]

2.3 9V BATTERY:

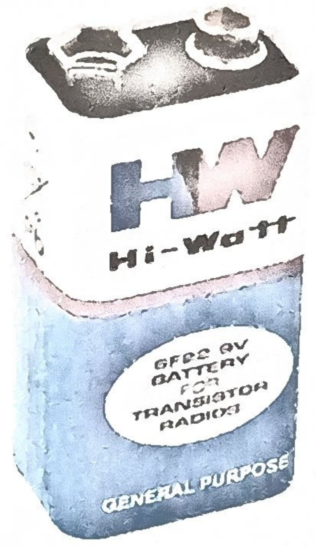

FIG 2.3.3 9V BATTERY

The **nine-volt battery**, or **9-volt battery**, is an electric battery that supplies a nominal voltage of 9 volts. Actual voltage measures 7.2 to 9.6 volts, depending on battery chemistry. Batteries of various sizes and capacities are manufactured; a very common size is known as **PP3**, introduced for early transistor radios. The PP3 has a rectangular prism shape with rounded edges and two polarized snap connectors on the top. This type is commonly used for many applications including household uses such as smoke and gas detectors, clocks, and toys.

The nine-volt PP3-size battery is commonly available in primary zinc–carbon and alkaline chemistry, in primary lithium iron disulfide and lithium manganese dioxide (sometimes designated CRV9[2]), and in rechargeable form in nickel–cadmium (Ni–Cd), nickel–metal hydride (Ni–MH) and lithium-ion. Mercury batteries of this format, once common, have been banned in many countries due to their toxicity. Designations for this format include *NEDA 1604* and *IEC 6F22* (for zinc-carbon) or *MN1604 6LR61* (for alkaline). The size, regardless of chemistry, is commonly designated *PP3*—a designation originally reserved solely for carbon-zinc, or in some countries, *E* or *E-block*. A range of PP batteries was produced in the past, with voltages of 4.5, 6, and 9 volts and different capacities; the larger 9-volt PP6, PP7, and PP9 are still available. A few other 9-volt battery sizes are available: A10 and A29.

2.4 IC CD 4017:

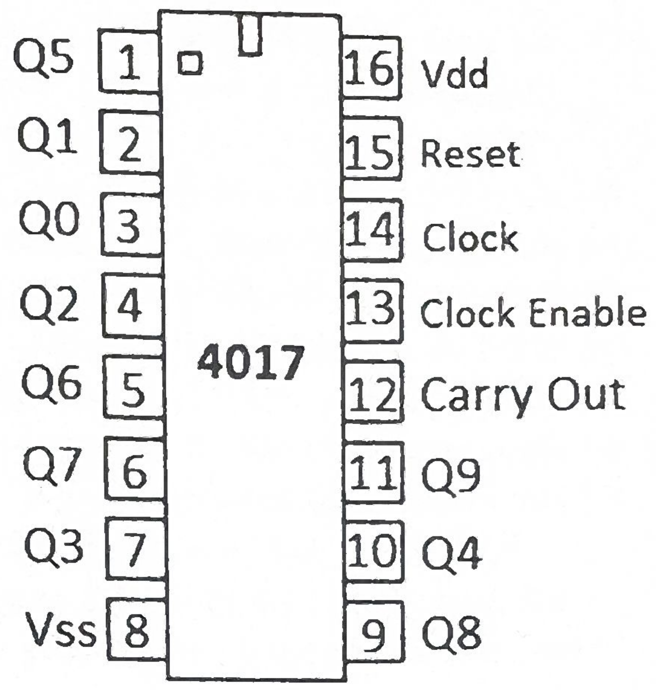

FIG 2.4.4 IC CD 4017

SPECAFICATION OF IC CD 4017

Supply voltage range	Min:3V Max:18v
Clock input frequency	5MHz
Clock pulse width	9ns
Input high time	30 ns
Output current	10 mA
Low power	10 µW
Storage Temperature ranges	−65°C to +150°C
Power Dissipation	700 mW
Lead Temperature	260°C

2.4.1 IC WORKING :

It is a 16-pin IC having 11 pins as an output, 3 control pins which are reset, clock and active low enable, and two power pins that is Vcc and ground.
All the Pins are given below.

- Pin-1: It is the output no. 5. It goes high when the counter reads 5th
- Pin-2: It is the output no. 1. It goes high when the counter reads 1st
- Pin-3: It is the output no. 0. It goes high when the counter reads 0th
- Pin-4: It is the output no. 2. It goes high when the counter reads 2nd
- Pin-5: It is the output no. 6. It goes high when the counter reads 6th
- Pin-6: It is the output no. 7. It goes high when the counter reads 7th
- Pin-7: It is the output no. 3. It goes high when the counter reads 3rd
- Pin-8: It is the Ground pin that is connected to a Low voltage.
- Pin-9: It is the output 8. It goes high when the counter reads 8th
- Pin-10: It is the output 4. It goes high when the counter reads 4th
- Pin-11: It is the output 9. It goes high when the counter reads 9th
- Pin-12: This is divided by 10 output pin which is used when cascading the IC with another CD4017 counter IC.
- Pin-13: This pin is the active low Enable pin. It connected to ground or logic LOW voltage. If this pin is connected to logic HIGH , then the IC will stop working.
- Pin-14: This pin is a clock input. It is the pin from where we give the input clock signal to the IC to count consecutively.
- Pin-15: This is the reset pin. If you need to reset the IC, then HIGH voltage is given to it.
- Pin-16: This is the power supply (Vcc) pin, ranging from 3V to 15V for the IC to turn it on.

2.5 Connecting wires:

FIG 2.5.5 Connecting wires

Wires are used to establish the connection between the components for flow of current. Connecting wires allows an electrical current to travel from one point on a circuit to another, because electricity needs a medium through which it can move.

2.6 Transistor:

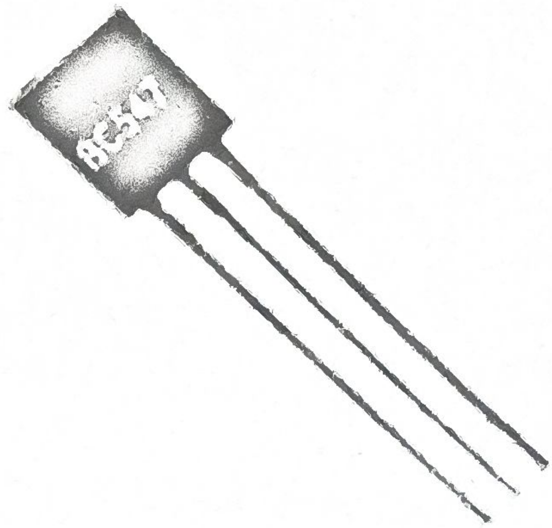

FIG 2.6.6 Transistor

A transistor is a type of semiconductor device that can be used to conduct and insulate electric current or voltage. A transistor basically acts as a switch and an amplifier. In simple words, we can say that a transistor is a miniature device that is used to control or regulate the flow of electronic signals. A typical transistor is composed of three layers of semiconductor materials or, more specifically, terminals which help to make a connection to an external circuit and carry the current. A voltage or current that is applied to any one pair of the terminals of atransistor controls the current through the other pair of terminals. There are three terminals for a transistor. They are listed below:

- **Base:** This is used to activate the transistor.
- **Collector:** It is the positive lead of the transistor.
- **Emitter:** It is the negative lead of the transistor.

2.7 Capacitor:

FIG 2.7.7 Capacitor

2.7 Breadboard:

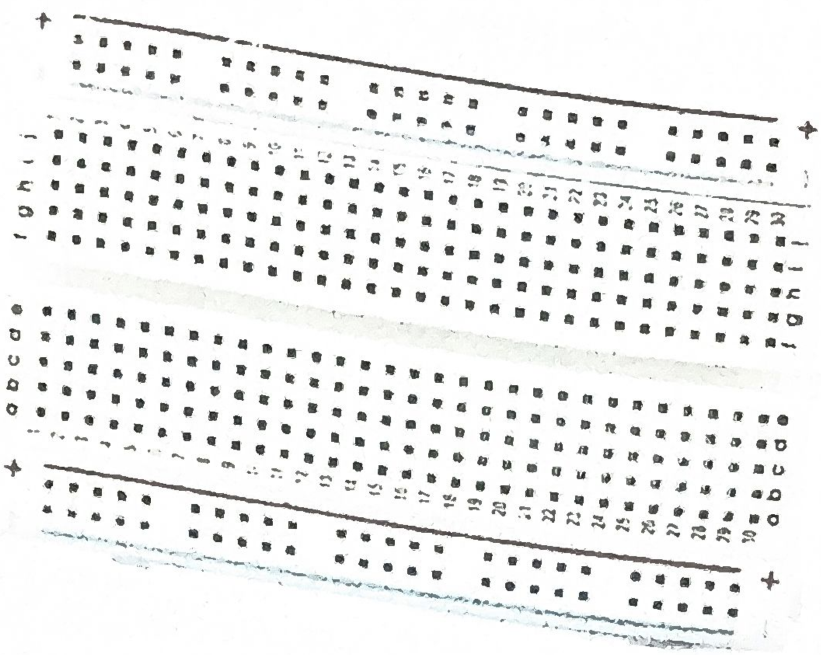

Fig 2.8.8 Bread board

Bread board is a thin plastic board used to hold electronic components like resistors , transistors , chips and some other that are wired together to produce an output. It is a widely used tool to design and test circuit. It is easier to mount components and reuse them. Since, components are not soldered we can change our circuit design at any point of time without any hassle. It consists of an array of conductive metal clips encased in a box made of white ASS plastic, where each clip is insulated with another clips. There are number of holes on the plastic box, arranged in particular fashion. A typical bread board layout consists of two types of region also called as strips. Bus strips are usually used to provide power supply to the circuit. It consists of two columns, one for power supply and another for ground.

CHAPTER-3 WORKING OF THE PROJECT:

3.1) BLOCK DIAGRAM :

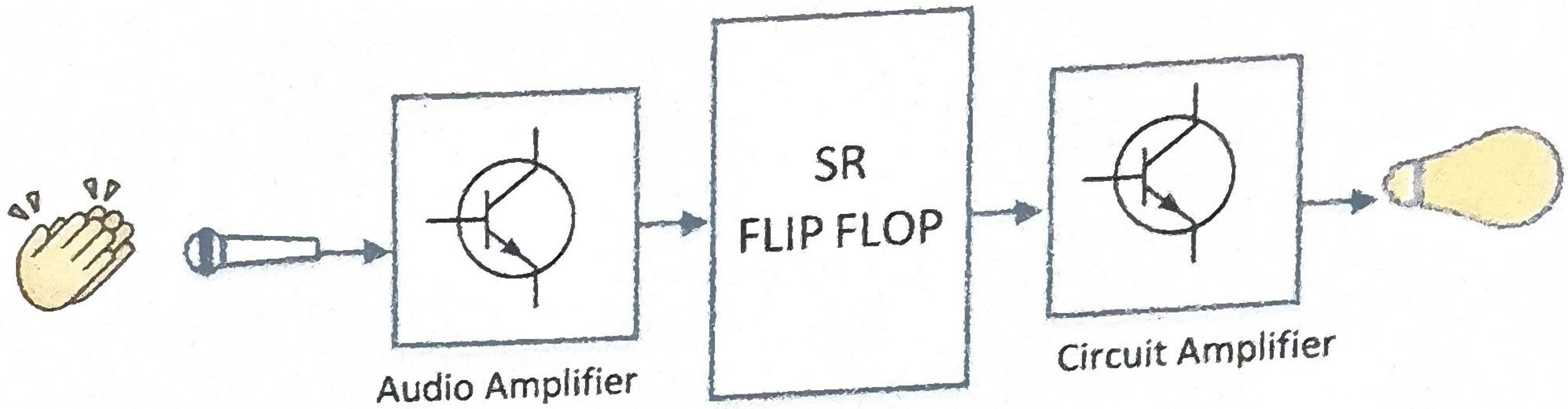

Fig 3.1.1 Block diagram

3.2) Explanation of Block Diagram :

a) Microphone:

It is a device which converts the sound vibrations into electrical signal. The microphone that we are using in this project is electret microphone. In the microphone capsule we have a FET amplifier, which amplifies the feeble electrical signal generated by microphone.

b) Amplifier block:

In the amplifier block we are amplifying the signal which is coming out of the microphone. The electrical signal coming out of microphone is so weak it is next to none.In this stage signal is amplified to make it stronger.

c) Bistable multivibrator:

Bistable multivibrator is the heart of the circuit, it is also called as S-R flip-flop. Using bistable multivibrator we can store any digital value i.e. '0' or '1' (ON or OFF), thus when we clap bistable multivibrator store it. Bistable multivibrator consist of two input one is called SET and another as RESET. When we give high value to SET it stores it, but then to remove the stored value we have to give high value to RESET pin. Thus SET is used to store the value and RESET is used to remove the stored value.

CHAPTER-4RESULT

4.1 Result:

The Below Picture shows that the Bulb is off :

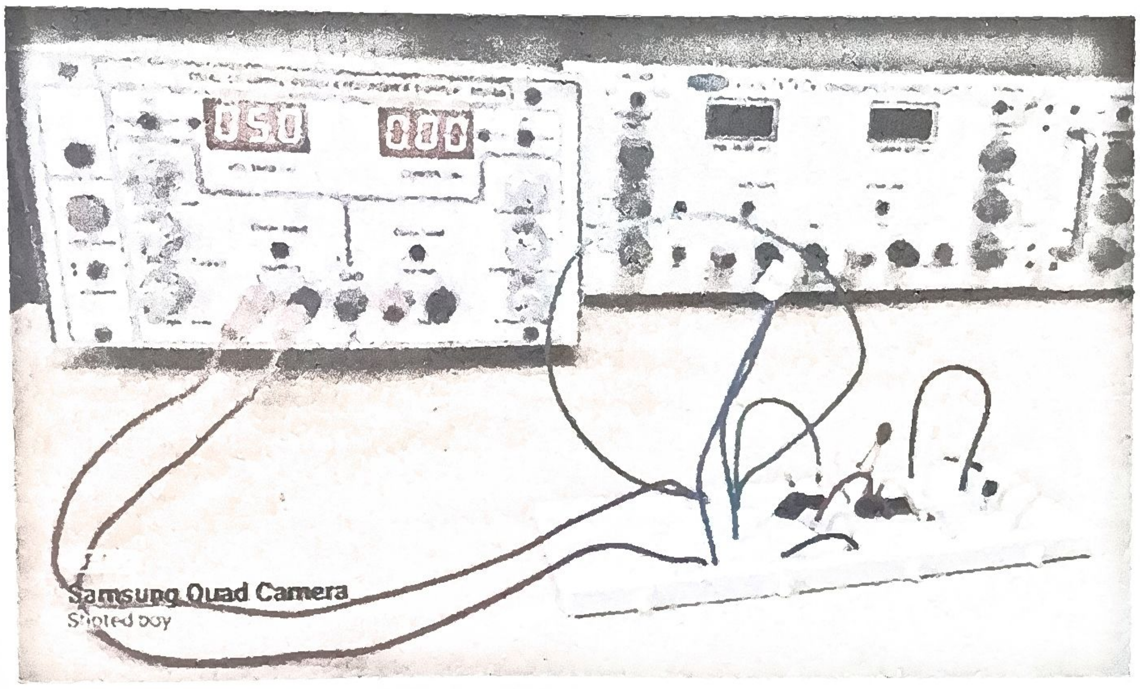

FIG 4.1 Bulb is OFF

In this chapter, we delve into the outcomes and analysis of our clap switch project, outlining of the achievements, challenges faced, and insights gained during the implementation of the circuit. It is cruicial to note that our approach different from conventional microcontroller-based systems, employing a setup consisting of a Breadboard Microphone, IC 4017, Transistor, Capacitor, 5v relay, 5v battery, LED, Resistor, Diode, and Bulb.

In This Picture The Bulb Turn On With The Clap:

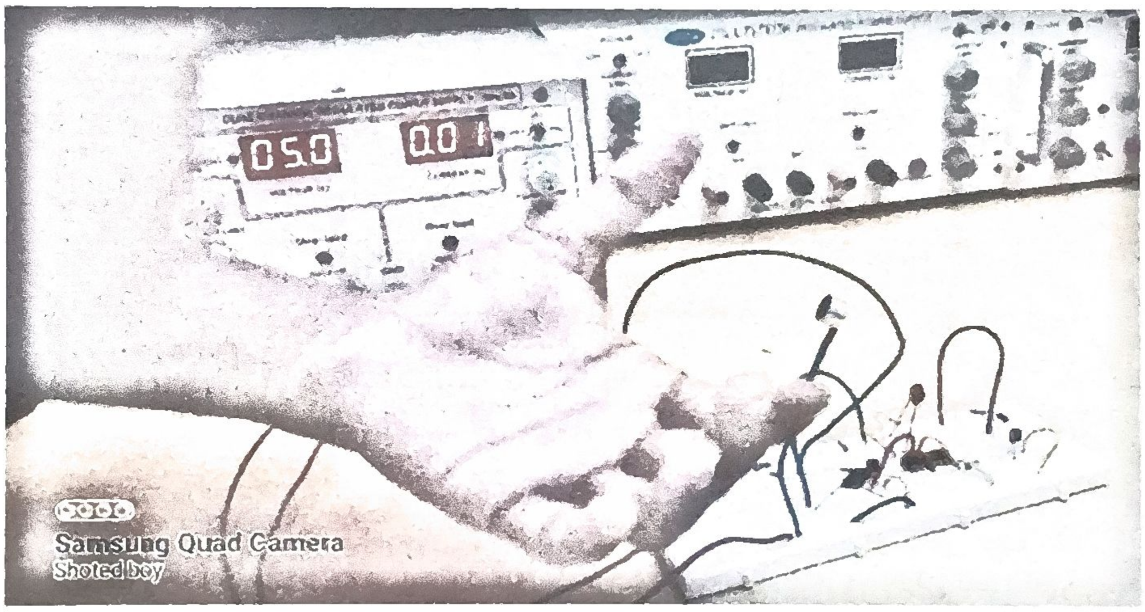

FIG 4.2 Bulb ON

Then Again, the BULB Turns Off With the Clap:

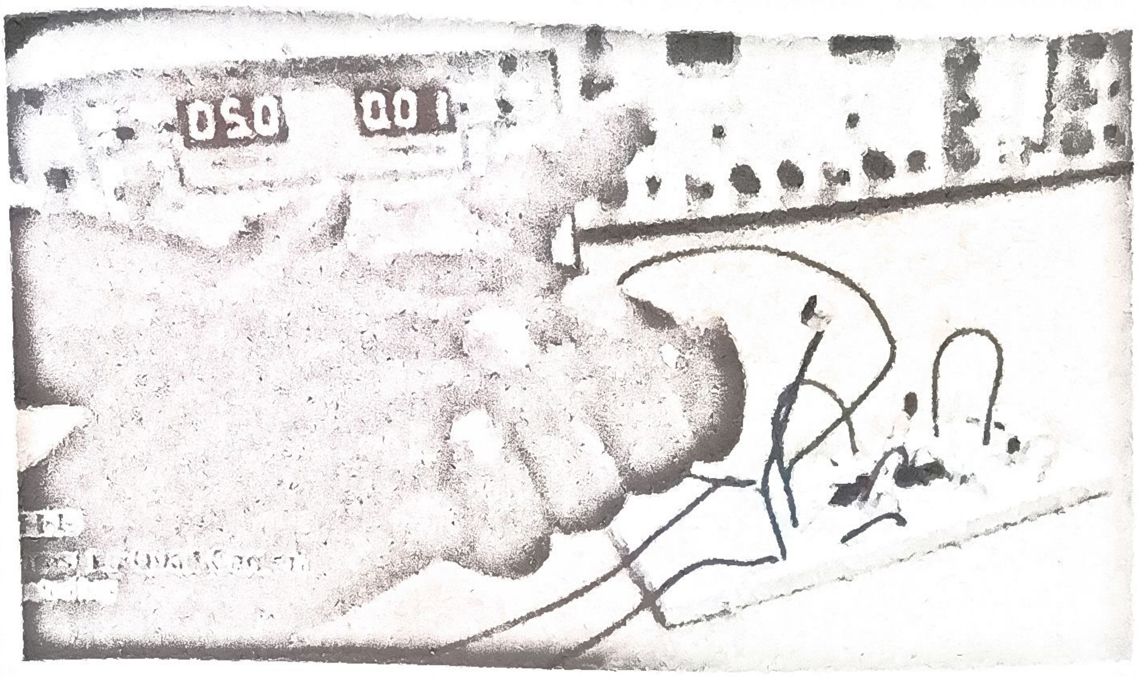

FIG 4.3 Bulb is OFF

CHAPTER-5 ADVANTAGES , DISADVANTAGES AND APPLICATION

5.1) Advantages :

Clap Switch Home Automation offers several advantages that cater to convenience, efficiency, and user experience in home automation:

1. **Hands-Free Operation:** Enables users to control appliances without physically touching switches, enhancing convenience, especially for individuals with mobility issues.

2. **Ease of Use:** Simple clap patterns serve as intuitive triggers, making it accessible for all members of the household without needing complex instructions.

3. **Cost-Effective:** Relatively low-cost implementation compared to more sophisticated automation systems, making it accessible for budget-conscious users.

4. **Energy Efficiency:** Facilitates energy conservation by ensuring appliances are turned off promptly when not in use, contributing to reduced electricity bills.

5. **Quick Installation:** Typically easy to install and set up, requiring basic electrical skills and minimal tools, reducing installation time and effort.

6. **Customizable Commands:** Allows users to define specific clap sequences for different appliances, providing flexibility and personalized automation options.

7. **No Need for Physical Switches:** Reduces wear and tear on physical switches and extends their lifespan.

8. **Suitability for Various Applications:** Can be used in various settings such as homes, offices, or public spaces for controlling lights, fans, and other electrical devices.

9. **No Additional Infrastructure Required:** Operates independently of complex infrastructure like Wi-Fi or central automation hubs, ensuring reliability even in basic setups.

10. **Engaging User Experience:** Offers a novel and interactive way to interact with home appliances, adding a touch of fun and engagement to daily routines.

Overall, Clap Switch Home Automation provides a user-friendly and cost-effective solution for automating basic household tasks, promoting efficiency, convenience, and energy savings in residential and small-scale commercial environments.

5.2) Disadvantages :

While Clap Switch Home Automation offers convenience, it also has some limitations and disadvantages that users should consider:

1. **Sound Sensitivity:** The system may be triggered unintentionally by loud noises or claps from sources other than the user, leading to unintended activations.

2. **Limited Control Options:** Typically supports basic commands like on/off for appliances based on predefined clap patterns, lacking the versatility of more advanced automation systems.

3. **Accuracy Issues:** May struggle to consistently recognize clap patterns accurately, especially in environments with varying background noise levels or acoustics.

4. **Single Trigger Mechanism:** Relies solely on clapping as the trigger, which may not be suitable for users with speech impairments or in situations where clapping is not practical.

5. **Installation Challenges:** Requires precise positioning of the microphone or sensor to effectively detect claps across different rooms, which can be cumbersome and may require adjustments.

6. **Interference:** Susceptible to interference from other electronic devices or appliances emitting similar frequencies, potentially affecting reliability and performance.

7. **Limited Integration:** Often lacks integration with advanced smart home platforms or voice assistants, limiting its interoperability with other smart devices and automation routines.

8. **Maintenance Needs:** Regular calibration and adjustment may be necessary to maintain accurate clap detection and prevent false triggers over time.

9. **User Adaptation:** Users may need time to adjust to the specific clap patterns required by the system, which could initially lead to confusion or frustration.

10. **Scalability:** Limited scalability for expanding to control a larger number of appliances or integrating with more complex automation scenarios beyond basic on/off control.

In summary, while Clap Switch Home Automation provides a straightforward and cost-effective solution for controlling appliances, it comes with inherent limitations related to accuracy, reliability, and integration capabilities compared to more advanced automation technologies. Users should evaluate these factors based on their specific needs and expectations before opting for this type of home automation solution.

5.3) Application :

Clap Switch Home Automation finds practical applications in various residential and commercial settings where hands-free control and convenience are desired. Here are some key applications:

1. **Home Lighting Control:**Easily turn on/off lights in different rooms with a simple clap, eliminating the need to find and reach for light switches.

2. **Fan Control:**Adjust ceiling fans or portable fans by clapping, providing comfort control without manual interaction.

3. **Bedroom Automation:**Ideal for bedrooms where users can control bedside lamps, ceiling lights, or even alarm clocks with a clap, enhancing convenience during nighttime routines.

4. **Kitchen Convenience:**Control kitchen appliances such as under-cabinet lights, coffee makers, or even exhaust fans with a clap, streamlining cooking activities.

5. **Office Settings:**Manage lighting and other electrical devices in offices or workspaces, offering quick access to essential controls without disrupting productivity.

6. **Elderly and Disabled Assistance:**Assist elderly or individuals with disabilities by providing an accessible way to control appliances, promoting independence and ease of use.

7. **Public Spaces:**Implement in public restrooms, corridors, or conference rooms to control lighting or ventilation systems, improving energy efficiency and user experience.

8. **Educational Environments:**Integrate into classrooms or lecture halls for easy control of projector systems, lights, or audio equipment, enhancing teaching efficiency.

9. **Retail and Hospitality:**Use in retail stores, hotels, or restaurants to manage lighting or ambiance settings, contributing to customer comfort and operational efficiency.

10. **Temporary Installations:**Deploy in temporary setups such as exhibitions, events, or pop-up stores to control lighting and promotional displays effortlessly.

Clap Switch Home Automation offers a straightforward and cost-effective solution for basic automation needs in diverse environments, providing convenience, energy efficiency, and ease of use for users across different applications.

CHAPTER- 6 CONCLUSION AND FUTURE SCOPE

6.1) CONCLUSION :

In conclusion, Clap Switch Home Automation presents a practical and accessible solution for enhancing convenience in controlling household appliances through sound-triggered commands. It offers users a hands-free way to manage lighting, fans, and other devices with simple clap patterns, reducing the need for manual interaction with switches. While providing affordability and ease of installation, it also comes with considerations such as sensitivity to ambient noise and limited integration capabilities compared to more advanced automation systems.

Overall, Clap Switch Home Automation serves as an introductory step into home automation, appealing particularly to those seeking basic functionality and simplicity in their daily routines. As technology continues to advance, future developments may address current limitations, potentially expanding its capabilities and integration with broader smart home ecosystems. For now, it remains a viable option for enhancing comfort and efficiency in residential and small-scale commercial settings where ease of use and cost-effectiveness are paramount.

6.2)FUTURE SCOPE:

The future scope of Clap Switch Home Automation holds promising developments and potential enhancements that could further elevate its functionality and appeal:

1. **Advanced Sound Recognition:** Integration of more sophisticated sound recognition algorithms to improve accuracy in detecting clap patterns amidst varying background noises, enhancing reliability.

2. **AI and Machine Learning:** Implementation of AI and machine learning algorithms to enable the system to learn user preferences and adapt to individual clap patterns over time, optimizing performance.

3. **Voice Command Integration:** Integration with voice assistants such as Amazon Alexa or Google Assistant to allow users to control appliances not only by clapping but also through voice commands, expanding usability and convenience.

4. **Smartphone App Connectivity:** Development of dedicated smartphone apps that enable remote monitoring and control of appliances connected to the Clap Switch system, providing users with flexibility and accessibility from anywhere.

5. **Energy Efficiency Features:** Incorporation of advanced energy monitoring and optimization features to track appliance usage patterns, suggest energy-saving measures, and contribute to sustainable living.

6. **Multi-Appliance Control:** Expansion of capabilities to control multiple appliances simultaneously or in groups with different clap sequences, offering greater customization and usability.

7. **Enhanced Security Measures:** Implementation of robust security protocols to safeguard user data and prevent unauthorized access, ensuring privacy and peace of mind.

8. **Integration with Smart Home Ecosystems:** Compatibility with broader smart home ecosystems and platforms, allowing seamless integration with other smart devices and automation routines.

9. **User Interface Improvements:** Development of intuitive user interfaces with visual or auditory feedback to enhance user experience and interaction with the system.

10. **Scalability and Flexibility:** Design enhancements to facilitate easy scalability for larger homes or commercial spaces, accommodating increased appliance control and more complex automation scenarios.

As technology continues to evolve, Clap Switch Home Automation is poised to evolve beyond its current capabilities, offering enhanced functionality, efficiency, and user-friendly features that align with the growing demand for smart home solutions. These advancements will not only improve convenience but also contribute to energy conservation and sustainable living practices, making Clap Switch Home Automation a compelling choice for modern homes and businesses alike.

REFERENCE

By following this reference guide, you can successfully implement and demonstrate a Clap Switch Home Automation system.

Electronics For You: Clap Switch Circuit Design https://www.electronicsforu.com/electronics-projects/clap-switch

1. **Microphone Module Datasheet**: https://components101.com/sensors/electret-microphone
2. **Relay Module Datasheet**: https://components101.com/modules/5v-relay-module
3. **Amplifier LM386 Datasheet**: https://www.ti.com/product/LM386

By following this reference guide, you can successfully implement and demonstrate a Clap Switch Home Automation system.