M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report
on

ELECTRONIC MOSQUITO REPELLENT

Submitted by

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR-639113.

MAY 2024

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous Institution, Affiliated to Anna University, Chennai)

BONAFIDE CERTIFICATE

Certified that this Report titled **"ELECTRONIC MOSQUITO REPELLENT"** is the bonafide work of **SANJAI S (927622BEE095), SHANMITHA R (927622BEE104)** who carried out the work during the academic year (2023-2024) under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other project report.

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Submitted for Minor Project II (18EEP202L) viva-voce Examination held at M.Kumarasamy College of Engineering, Karur-639113 on ……..

DECLARATION

We affirm that the Minor Project I report titled "**ELECTRONIC MOSQUITO REPELLENT"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

REG.NO	STUDENT NAME	SIGNATURE
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VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry, and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

- ✓ To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- ✓ **PEO1:** Graduates will have flourishing career in the core areas of Electrical Engineering and also alied engineering.
- ✓ **PEO2:** Graduates will pursue higher studies and succeed in academic/research careers.
- ✓ **PEO3:** Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.
- ✓ **PEO4:** Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES (POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions:

Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work:. Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The following are the Program Specific Outcomes of Engineering Students:

- **PSO1:** Apply the basic concepts of mathematics and science to analyze and design circuits, controls, Electrical machines and drives to solve complex problems.
- **PSO2:** Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.
- **PSO3:** Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real-world problems.

Abstract (Key Words)	Mapping of POs and PSOs
555 IC as Astable Multivibrator ,Variable Frequency Output, Ultrasonic Speaker, Compact and Portable Design, Power Efficiency.	PO1, PO2, PO3, PO4, PO6, PO7, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3

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We would like to express my deep gratitude to our Minor Project Guide **Mr.M.Ramesh M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for his constant encouragement, kind co-operation, valuable suggestions and support rendered in making our project a success.

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We are glad to thank all the **Faculty Members** of **Department of Electrical and Electronics Engineering** for extending a warm helping hand and valuable suggestions throughout the project.

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TABLE OF CONTENTS

ABSTRACT

The circuit utilizing a fan, blue light, and a human sensor is designed without employing an Arduino microcontroller. This system detects human presence through a passive infrared (PIR) sensor, triggering a 555 timer integrated circuit (IC) configured on monostable mode. After detection the 555 timer activates the centripetal fan and wavelength-specific LED emitter for a predetermined duration, providing an effective detterent against mosquitoes. This flexibility ensures optimal performance in different environments. The project emphasizes a compact and portable design, making it suitable for various settings, including indoor and outdoor use. With careful design considerations, the project aims to be power-efficient, allowing for prolonged operation on standard power sources. The Electronic Mosquito Repellent using the 555 IC aims to provide an efficient, portable, and adjustable solution for mosquito control. The project has its ability to repel mosquitoes effectively in various conditions while maintaining user-friendly features and power efficiency.

SURVEY FORM

(SAMPLE)


GPS Map Camera
Vengamedu, Tamil Nadu, India
249, Main Rd, Vengamedu, Karur, Tamil Nadu 639006, India
Lat 10.975427°
Long 78.077447°
18/09/23 01:35 PM GMT +05:30
Google

SURVEY REPORT

By taking the survey from the above localities, we have found that hospitals are experiencing a high number of patients with mosquito-borne diseases. The surrounding environment has led to mosquitoes infesting the house, causing the residents to contract mosquito-borne diseases.

CHAPTER 1

SURVEY FORM ANALYSIS

1.1 NAME AND ADDRESS OF THE COMMUNITY:

NAME: Mr. P. Arunkumar.

ADDRESS: S/O, S. Palanisamy, 77/36 Ganeshapuram, Thuraiyur road, Namakkal, 637001.

NAME: Mr. S. Balasanmugam.

ADDRESS: S/O, P.Subramani, 5/30 Mettupalayam, East Thavuttupalayam, Karur, 639113.

NAME: Dr. A. Manivel.

ADDRESS: S/O, M. Arumugam, 29/58 Water tank street, Vengamedu, Karur, 639006.

NAME: Mrs .M .Bavani.

ADDRESS: D/O, S. Muthusamy, 10/30 Mettupalayam,East Thavuttupalayam, Karur,639113.

NAME: Mr. S. Selvi.

ADDRESS: D/O, A. Periyasamy, 67/100 Nehru street Paramathi velur, Namakkal,637207.

1.2 PROBLEM IDENTIFICATION:

From the survey we've analyzed that mosquitoes are causing serious diseases and viruses which afflict human. Not only can mosquitoes carry diseases that affects humans, but they also can transmit several diseases and parasites that dogs and horses are very susceptible to. Mosquitoes are vectors for various diseases. Mosquitoes-borne diseases can impose a substantial economic burden on societies. They lead to increased healthcare costs, reduced productivity due to illness.

CHAPTER 2

LITERATURE REVIEW

Paper 1: Construction and empirical study of electronic piezo buzzer mosquito repellent

Author: H.I. Ikeri, Augustine Ike Onyia

Year: 2017

Description:

A successful construction and study of a 20 – 70 kHz Electronic Mosquito Repellent is here presented. The device has three compartments: a power unit which ensures a constant 5 V DC supply to the system, the oscillator which generates the ultra-frequencies that drive the buzzer and the piezo buzzer that converts the ultra-frequencies to ultrasounds. The ultrasonic device sweeps sound waves in the range of 20 – 70 kHz which are well above the upper human audible limit but nonetheless produces enough stress on the nervous system of mosquitoes to repel them.

Paper 2: Electronic pest repellent

Author: Dileep kumar Tiwari Mamtaz Alam

Year: 2016

Description:

So many remarkable things are happening in the world of science and technology but yet there is no effective solution to repel pests electronically. This review paper focus on the various pest controlling methods and also talks about the electronic pest controller based on frequency generation technique. The various pesticides, herbicides and other repellent are toxic and risk for human health. Electronic Pest Repellent (EPR) is an emerging technology which is cheap, eco-friendly and effective produces no risk at all to human.

Paper 3: Electronic mosquito repellents for preventing mosquito bites and malarial infection.

Author:Cochrane

Year:2007

Description:

Electronic mosquito repellent (EMRs) are marketed in response to a huge demand from the public for convenient, safe, and effective anti-mosquito product. Female Anopheles mosquitoes transmit malaria by sucking blood from humans, and these small handheld, battery-powered EMRs are intended to repel them by emitting a high frequency buzz almost inaudible to the human ear. They can be used both indoors and outdoors, and are claimed to repel mosquitoes within range of up to 2.5 meters. Mobile phone companies also market a ring tone that is claimed to repel mosquitoes within a one-meter radius.

Paper 4: Electronic mosquito repellents for preventing bites and malaria infection

Reference: ncbi.nlm.nih.gov

Year:2007

Description:

Malaria affects more than 250 million people and causes more than a million deaths each year (WHO 2005). One important control strategy against this and other mosquito-borne diseases is mosquito control, which aims to reduce human-mosquito contact. Different control measures are used routinely against mosquitoes and their larvae, including chemical (eg insecticide), biological (eg larvivorous fish or pathogenic fungi), environmental (eg land filling or drainage), and personal protection (eg mosquito repellents formulated as pills, coils, ointments, lotions, and sprays; and insecticide-treated or untreated bed nets).

Paper 5: Electronic Rodent Repellent Device

Author: Stephen A. Schumake

Year: 1995

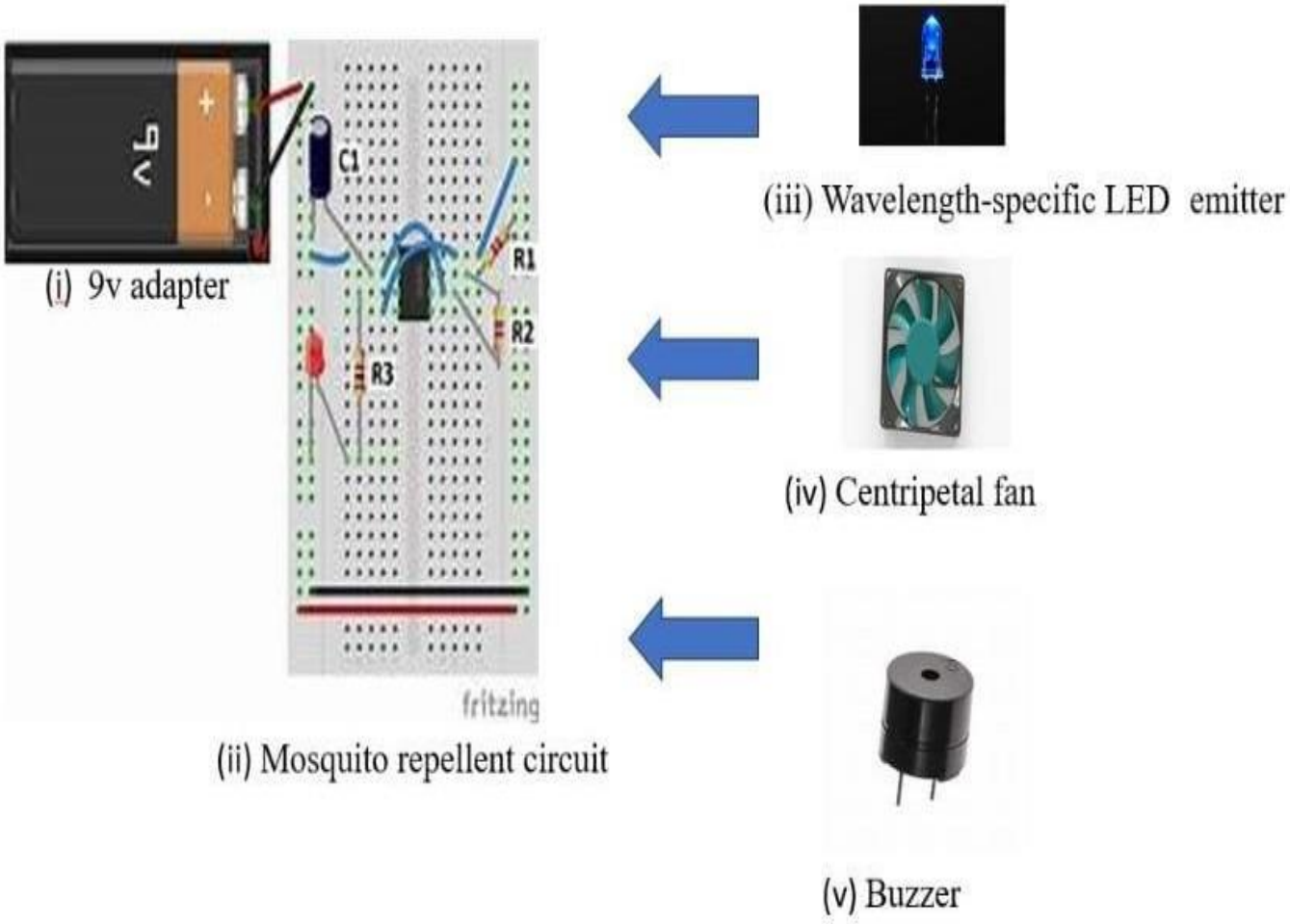
Description:

A wide variety of ultrasonic, electromagnetic, mechanical/vibrational and Electrical barrier devices have been researched, developed, and marketed over the past 30years. Although there are currently no Environmental Protection Agency (EPA) registration requirements, human commercially manufactured, marketed, and retailed. An analysis follows of research and development attempts to reduce habituation effect, to incorporate and integrate ultrasonic devices into traditional rodent control methods and to improve efficacy.

CHAPTER 3

PROPOSED METHODOLOGY

3.1 BLOCK DIAGRAM



3.2 DESCRIPTION

Components needed are passive infrared (PIR) sensor which detects human presence. 555 timer IC which configured in monostable mode to control timing and a centripetal fan which pulls the mosquito towards its center. And also a wavelength-specific LED emitter is used by which mosquitoes are attracted to certain wavelengths of light. It can be used to attract mosquitoes towards the repellent area. Resistor and capacitors where used to set timing intervals for the 555 timer. Transistor is used to control the power supplied to the centripetal fan and wavelength-specific LED emitter. power source is typically a battery or dc power supply. Circuit design can be start with PIR sensor connection, the PIR sensor output is connected to the trigger pin (pin2) of the 555 timer IC when human presence is detected, the PIR sensor sends a signal to trigger the 555 timer. And then the 555 timer configuration in monostable mode. In this mode, it produces a single output pulse of a specific duration when triggered. In Centripetal fan and wavelength-specific LED emitter, the output pin (pin 3) of the timer is connected to transistor or directly to these two components. When the 555 timer is triggered, it activates the transistor or directly powers the centripetal fan and wavelength-specific LED emitter for the predetermination duration. The time interval of the 555 timer is determined by the values of resistors and capacitors connected to it. These components can be adjusted to set the duration for which the centripetal fan and wavelength-specific LED emitter remain active after detecting human presence. The entire circuit is powered by a suitable power source, providing the necessary voltage and current to operate the components efficiency. Test the circuit to ensure that it correctly detects human presence and activates the centripetal fan and wavelength-specific LED emitter accordingly. Adjust the values of resistors and capacitor in the 555 timer circuit to achieve the desired duration for centripetal fan and wavelength-specific LED emitter activation. Finally, position the circuit strategically to cover the desired area effectively and repel mosquitoes efficiently.

3.3 COST ESTIMATION

S.No	Components Description	Quantity	Cost
1.	IC	1	150
2.	Buzzer	1	230
3.	9V Battery	1	300
4.	Resistor and capacitors	1	50
5.	Centripetal fan	1	150
6.	Wavelength-specific LED emitter	1	120
7.	Additional components	As required	300
		TOTAL	**1300**

CHAPTER 4

RESULT AND DISCUSSION

4.1 HARDWARE COMPONENT DESCRIPTION

WAVELENGTH-SPECIFIC LED EMITTER

The purpose and use of wavelength-specific LED emitter is to emit light in a specific range of wavelengths, typically between 360-400 nanometers, which are known to repel or disrupt mosquitoes. And the mosqutioes are attracted to certain wavelength of light. It can be used to attract the mosquito towards the repellent area. These LEDs target specific photoreceptors in mosquitoes, affecting their behavior or physiology, thereby reducing their attraction to human or make them unable to reproduce effectively.

Fig. No: 4.1.1

CENTRIPETAL FAN

It serves the purpose of creating airflow within the device. Its use is to draw in air, along with any mosquitoes or other flying insects present in the vicinity, towards the repellent or trapping mechanism. By generating a centripetal force, the fan helps to direct the airflow in a circular motion, ensuring efficient capture of insects and dispersal of repellent substances if applicable. This airflow management is crucial for the effective functioning of this device, ensuring that it can attract, trap, or repel mosquitoes effectively.

Fig. No: 4.1.2

555 TIMER IC

It can be used to generate specific pulse patterns that control the operation. It will generate pulses at a specific frequency which can be chosen to match the resonance frequency of the mosquitoes, which may interferes with their ability to locate and feed on humans. These pulses can drive other components of this device, such as ultrasonic transducer or LEDs which emit light waves.

Fig. No: 4.1.3

4.2 HARDWARE KIT

Fig. No: 4.2.1

4.3 WORKING PRINCIPLE

When the circuit is powered on, the 555 timer starts generating the continuous square wave signal. This signal periodically turns the wavelength-specific LED emitter and the centripetal fan on and off. The PIR sensor detects the presence of humans by sensing the infrared radiation emitted by their bodies. When it detects the movement, it outputs a high signal. The output of the PIR sensor is used to control the activation of the entire mosquito repellent system, ensuring it only operates when human presence is detected. The frequency and duty cycle of this operation can be adjusted by changing the values of resistors and capacitors connected to the 555 timer IC. The LED emitter is designed to emit light at a specific wavelength, typically in the blue (or) ultraviolet range. These wavelengths are particularly effective in attracting mosquitoes. The LED is controlled by the signal from the 555 timer and the PIR sensor. It is turned on when the PIR sensor detects the human presence and the timer cycle is active. The centripetal fan creates airflow that helps to disperse mosquitoes attracted to the light. It is also controlled by the 555 timer and PIR sensor, operating only when needed. The entire circuit is powered by a dc power source, such as battery or a adapter. The power supply provides the necessary voltage and current to drive the 555 timer, the LED emitter, and the centripetal fan. When the PIR sensor no longer detects human presence, it stops sending the signal. This causes the 555 timer to reset or stop generating pulse turning off. And conserving the energy.

CHAPTER 5

CONCLUSION

In this project, we successfully designed and implemented a mosquito repellent device. The absence of an Arduino microcontroller in our design demonstrates the feasibility and effectiveness of simpler electronic components in achieving the desired functionality. Our circuit effectively detects human presence using a passive infrared (PIR) sensor, triggering the centripetal fan and wavelength-specific LED emitter to operate. This approach leverages the attraction of mosquitoes to LED and the dispersal capability of the fan to keep mosquitoes away from the humans. By avoiding the use of the microcontroller, we simplified the design and reduced costs while maintaining reliability and ease of maintenance.

Overall, this project showcases an efficient, low-cost alternative to more complex microcontroller-based solutions, highlighting the potential for simple electronic circuits in practical applications like mosquito repellence. Further improvements could involve optimizing sensor sensitivity and exploring additional repellent mechanisms to enhance the system effectiveness.

5.2REFERENCES

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3. Mosquito Repellent Circuit - Engineering Research Publication https://www.erpublication.org/published_paper/IJETR041243

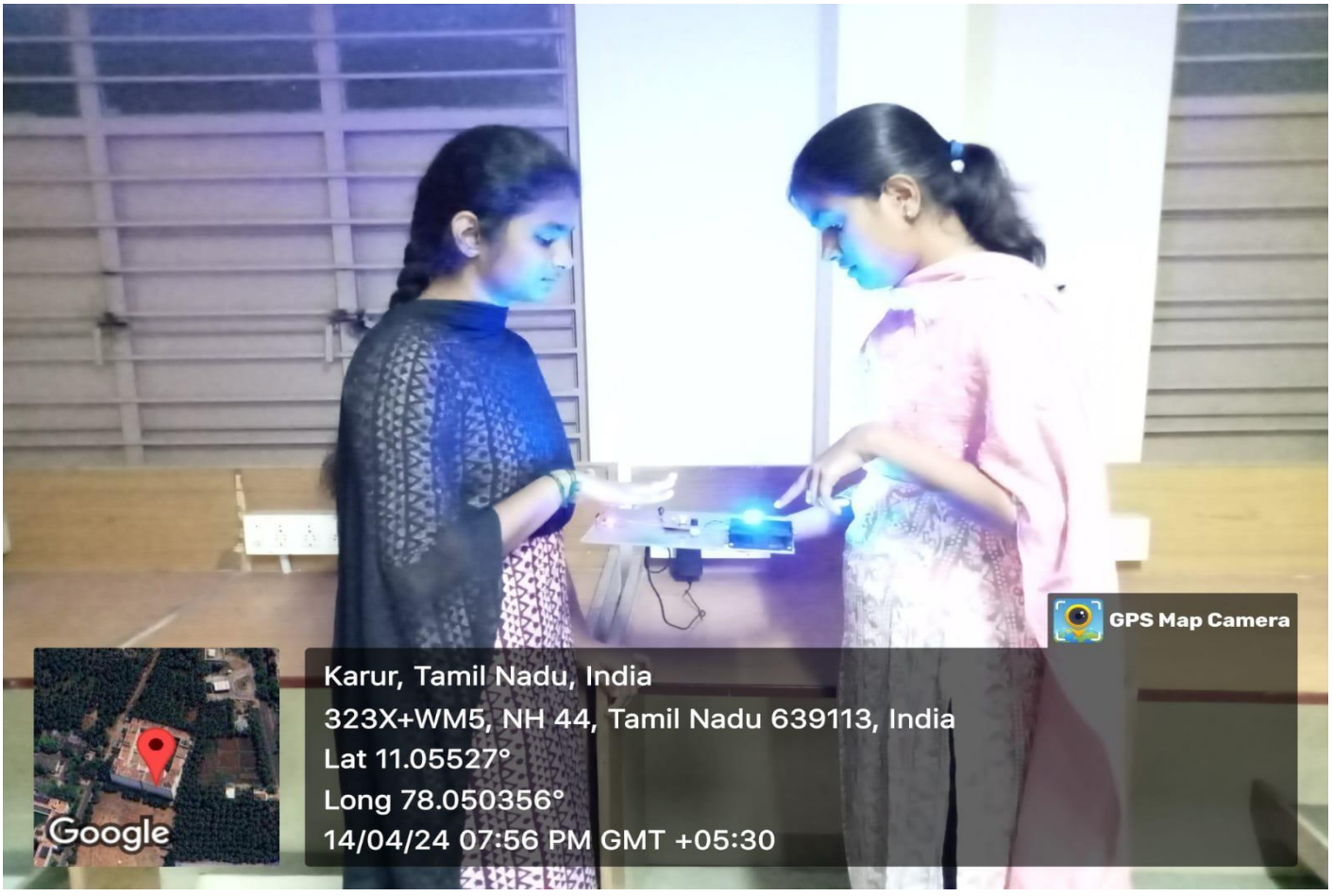
4. Evaluation of electronic mosquito repeller under laboratory and field condition https://www.cochranelibrary.com.

5. Garcia R, Des Rochers B, Voigt WG. Evalution of electronic mosquito repellers under laboratory and field condition. Published in 1974.

6. Solar powered smart ultrasonic insects repellent with DTMH and manual control for agriculture. https://ieeexplore.ieee.org/document/7890869.

5.3 APPENDIX

SCREENSHOT OF PROJECT



DEMONSTRATION VIDEO LINK

https://drive.google.com/file/d/1gPKbLXJ_ZGmUCJ8QQc1GwCMUU_WdlFU9/view?usp=drivesdk