iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** III **Month of publication:** March 2024

DOI: https://doi.org/10.22214/ijraset.2024.59140

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue III Mar 2024- Available at www.ijraset.com

Development and Fabrication of Locust Control System

V.N. Mujbaile[1], Prajwal Guhe[2], Deepanshu Khandagale[3], Adesh Jikar[4], Adesh Kolse[5], Saurabh Agre[6]
[1]Assistant Professor, [2, 3, 4, 5,6]U.G. Student, Department of Mechanical Engineering K.D.K. College of Engineering Nagpur,India

Abstract: ***Locusts, known for their destructive swarms, pose a major threat to agriculture. Their ability to change behavior and become gregarious leads to devastating crop loss. Our solution addresses this challenge with an innovative locust control device. The device utilizes ultraviolet light to attract locusts into a containment box. A high-voltage system within the box eliminates the trapped insects. Security measures are integrated to protect the device. Additionally, the remains of the locusts can be easily decomposed, providing potential benefits.***

Keywords: Locusts management, Grasshopper, Locust bacterial. Desert locust, Locust hate.

I. INTRODUCTION

Locusts belong to the Acrididae family of grasshoppers, comprising a vast majority of the 11,000 known grasshopper species. Unlike their less mobile relatives, locusts can swarm and cover incredible distances – traveling up to 150km per day at speeds of 16-19 km/hr. Their distribution spans nearly every continent except North America and Antarctica. Locust has become a big problem for humans and farmers in India. So, to tackle this situation several methods are present. But every method has its drawbacks and efficiency. In our project, we are making a device which has fewer drawbacks and will kill the locust more rapidly and efficiently. This device is also economical and easy to handle. Also, if required further modifications can be made since its design is simple. We feel that it will gain a good attention in the market. Locusts form enormous swarms that spread across regions, devouring crops and leaving serious agricultural damage in their wake.Locust swarms aren't merely an agricultural nuisance; they instigate economic ripple effects. A single swarm can consume the equivalent food of thousands of people per day. The loss of crops plunges individual farmers into debt, while price hikes for staple foods strain the budgets of families across entire regions. Furthermore, when locust plagues are severe enough to destabilize agricultural production on a large scale, they contribute to food insecurity and can even jeopardize national trade balances. While traditional chemical insecticides remain a tool against locusts, their potential environmental harm fuels the search for more sustainable solutions. Researchers explore using fungi that specifically target locusts, minimizing harm to other insects. Other strategies involve pheromone-based traps to disrupt mating, and early detection systems utilizing satellite imagery and localized monitoring to target locust breeding grounds before swarms can fully form. Farmers battling locusts wage war on an uneven playing field. Swarms can descend without warning, devouring months of labor within hours. Limited access to early warning systems or control resources, especially in less developed regions, often leaves farmers with a sense of helplessness. Beyond the financial devastation, the constant threat of locusts takes an emotional toll, fueling stress and uncertainty about the future viability of their livelihood.

II. LITERATURE REVIEW

1) According to Mr. Peter Kairu Kariuki[1],a study in Nakuru County, Kenya, examined grasshopper and locust diversity across ecological zones. A total of 456 individuals from Acrididae and Pyrgomorphidae families were recorded, with Ailopus thalassinus being the most abundant species. While abundance varied among zones, species diversity correlated strongly with abundance, emphasizing the importance of ecological zoning for biodiversity conservation.
2) According to Mr. Swapnil A. Meshram [2], novel solar light trap models are proposed in this paper as highly effective Integrated Pest Management (IPM) tools for monitoring and controlling insect pests in agriculture. These traps, featuring an iron structure and solar-powered LED bulbs, offer a cost-effective and environmentally friendly solution with minimal harm to nature, providing an efficient alternative to conventional pest control methods.
3) According to Ms. Ananya M [3], addressing the challenge of insect control in agriculture often involves harmful chemical pesticides, leading to financial and environmental concerns. Transitioning to organic and integrated farming methods utilizing automated solar-powered insect traps offers an effective and sustainable solution. These traps, with their simple design and operation, provide efficient pest control across various crops, offering practicality and ease of transport for farmers.
4) According to Mr. Harinder Makkar [4], locust infestations pose a severe threat to agriculture and livelihoods, yet locusts and grasshoppers offer valuable protein sources. However, their potential as animal feed is hindered by insecticide contamination. Despite challenges in mass rearing, various harvesting methods present opportunities for utilization in animal feed. Integrating insecticide use with strategic harvesting approaches could effectively manage pests while promoting sustainable agricultural practices.
5) Insects are vital to our planet's ecosystems as pollinators, recyclers, and food sources. Collection methods vary based on purpose, whether for hobby, study, or research. Dr. Manoj Kumar[5] emphasizes that expert techniques are essential for optimal preservation of insect specimens, ensuring their scientific and aesthetic value.
6) Mr. M. Krishnamoorthi [6] highlights the ecological importance of insects. Proper collection methods depend on the intended use. Expert preservation techniques are crucial for maintaining the scientific and aesthetic integrity of insect specimens.
7) Mr. Makinde Kayode [7] presents a 200-liter solar-powered freezer addressing unreliable power in rural areas. This self-sufficient system utilizes a DC compressor, solar panels, battery, and charge controller. A microcontroller optimizes efficiency. Key features include a 26-hour runtime without sunlight and ample storage space.
8) Dr. Aung Ze Ya [8] details a solar PV system designed to electrify a small village. The system addresses diverse community needs, including lighting, household appliances, and a clinic's refrigerator. Careful load calculations and expert component selection ensure optimal functionality, reflecting Dr. Aung Ze Ya's extensive design experience.
9) Mr.Brian Halubanza [9] examines challenges in locust control within Zambia's Sikaunzwe Agriculture Camp. Despite early warning systems, issues like incorrect species identification, limited staff, and inaccessible terrain hinder management. Brian Halubanza explores potential technological solutions including machine learning, drones, geospatial technology, and the Internet of Things to address these challenges and mitigate locust threats to food security.
10) Mr. J.P. Egonyu [10] highlights the potential of harvesting locust swarms for food and sustainable pest management. With a long history of consumption, locusts offer nutritional benefits comparable to traditional meat. While safety concerns necessitate regulation, this approach could provide food security, economic opportunities, and reduce insecticide reliance.
11) Ms. Eman A. Khalifa [11] investigates the impact of electrocuting insect traps (EITs) on the spread and viability of microorganisms carried by houseflies. Lab-reared flies were contaminated with Cryptosporidium oocysts and non-lactose enterobacteria. Their exposure to EITs was followed by assessments of microorganism dispersal and survival, informing potential disease transmission risks.
12) Mr. Brigitte Poulin [12] explores mosquito traps as a less harmful alternative to insecticide spraying in France's Camargue region. 16 CO2/octenol traps reduced targeted mosquito populations significantly, with minimal impact on non-target insects. While less effective against certain species, this approach avoids the environmental damage of Bti spraying, as demonstrated by its lack of effect on a house martin colony.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue III Mar 2024- Available at www.ijraset.com

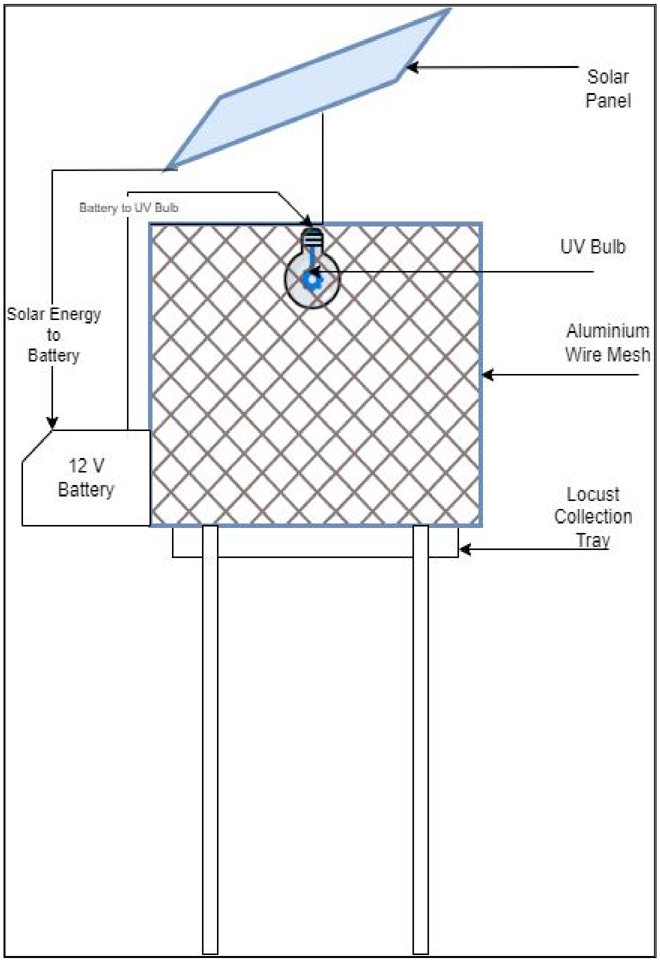


Fig. 1. 2D Concept Diagram of The Model

III. PROBLEM IDENTIFICATION

The old ways of dealing with locusts were a major bummer. Blasting everything with harsh chemicals kills off good bugs too, leaves nasty stuff in the environment, and can even be risky for people. Plus, spraying from planes is expensive and it's tricky to get those chemicals everywhere a massive swarm is hanging out. Let's face it, we need a way to target just the locusts, do it in a way that's safe for nature, and be able to act fast to save crops. That's the whole reason we came up with our new and improved locust control system.

IV. OBJECTIVES

1) To study the present system of locust control.
2) To design various component of locust control system.
3) To fabricate and assemble the various component of the system.
4) Experimentation on the system

V. METHODOLOGY

1) The study of present locust control system.
2) Drawing of various component and the complete assembly drawing.
3) Designing of various component of the system.
4) CAD Drawing of all components and assembly.
5) Fabrication and assembly of all the component.
6) Experimentation of the setup.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue III Mar 2024- Available at www.ijraset.com

VI. IMPORTANT SPECIES OF LOCUSTS

These 10 locust species are notorious for their devastating impact on agriculture worldwide:

1) Australian Locust
2) Moroccan Locust
3) Red Locust
4) South American Locust
5) Bombay Locust
6) Italian Locust
7) Tree Locust
8) Brown Locust
9) Desert Locust
10) Migratory Locust

VII. EXISTING LOCUSTS CONTROL SYSTEM

1) Drones are used to kill locusts.
2) Chemicals used to kill locusts
3) Noise is used to get rid of locusts

VIII. ANALYSIS OF SELECTION OF COMPONENTS

1) Number of Locust Accommodated in Box: 49000 to 63000
2) Mass Of One Locust = 4 to 6 g
3) Number Of Locust in One Swarm = 80 million
4) Board Thickness = 10mm + 2.2mm = 22.2mm (Here Clearance = 2.2)
5) Inner Space = 435mm * 2 = 870m
6) Depth = 282.6mm
7) Box Dimensions:

- Length = 20 inches = 0.5080m
- Width = 20 inches = 0.5080m
- Height = 5 ft. = 1.524m

8) Area of main Body = (Length * Width)
   = (0.5080 * 0.5080)
   = 0.2580 m^2
9) Volume = (Length * Width * Height)
   = (0.5080*0.5080*1.524)
   = 0.3932 m^3
10) Solar Panel Dimensions:

- Length = 14.5 inches = 0.3683m
- Width = 14.1 inches = 0.3581m
- Height = 0.67 inches = 0.0170m

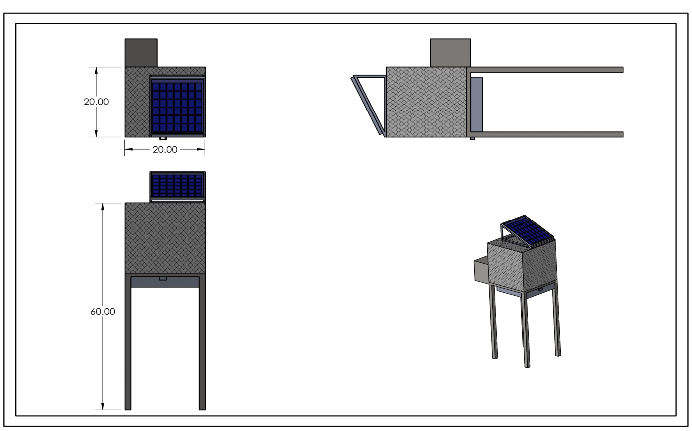


Fig. 2. 3D Concept Diagram of The Model

IX. COMPONENTS OF THE SYSTEM

1) Solar Panel
2) Aluminum Wire Fence
3) UV Light
4) Wooden Frame
5) Base of cabin (Contains all electric Circuits)
6) Battery
7) Collection Tray
8) Iron Stand Frame

X. ANALYSIS OF SELECTION OF COMPONENTS

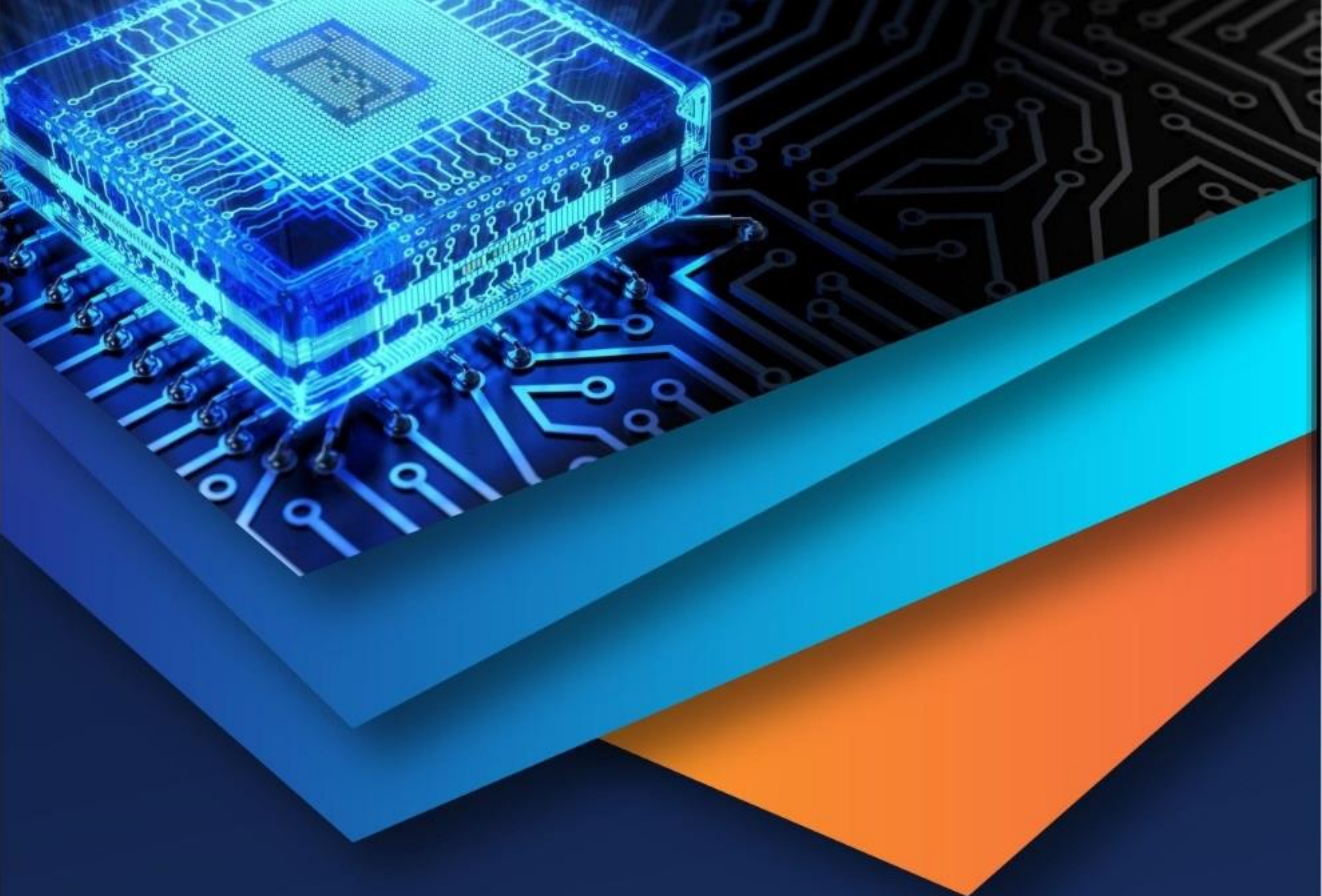
1) Main outer frame: The main frame of the project is made up of iron because of outer frame covering needs robust.
2) Aluminum mesh: Aluminum is a good conductor of heat and electricity and also reduces the cost of the project we select aluminum for carrying high voltage supply.
3) UV Light: Locusts have a tendency they always attracted to blue color UV light at night hence it may be most useful for the attraction of locusts at night.
4) Solar Panel: In day time the solar energy will be captured into solar panel mounted at the topmost center position of the project.
5) High voltage circuit: This voltage is now further boosted using a combination of Diodes and Capacitors, which is typically a Voltage multiplier. Typically, the circuit uses Voltage Triple, which triples the available voltage from the secondary winding of the transformer. This high voltage is passed onto the wire mesh of the system.
6) Alternative power supply: The system works on both DC supply as well as AC supply
7) Battery: 12V Battery is used to supply current to the circuit and the UV light

XI. CONCLUSION

The locust-killing machine offers an innovative, proactive approach to combating destructive locust swarms. By exploiting locust behavior and integrating advanced technology, this device provides a promising alternative to traditional pest control. Its focus on attracting, trapping, and eliminating locusts – while prioritizing safety and minimizing environmental impact – makes it a valuable tool for protecting crops and promoting food security in affected regions.

REFERENCES

[1] Kariuki, Peter & Toroitich, Faith & Ongamo, George & Nduko, John & Owino, Eunice & King'ori, Anthony. (2019). “Diversity and Abundance of Grasshopper and Locust Species in Nakuru County, Kenya”. 8. 102-109
[2] Meshram, Swapnil A., Shubham A. Kapade, Akshay D. Chaudhari, and Kirti B. Nagane. "Design a solar light trap for control of field crop insects." International research journal of engineering and technology 5 (2018).
[3] Ananya M1 & Gagan Y2 & Hemachandan H3 & Prof. Sathish H4. (2020). “Design and Fabrication of Automated Solar Insect Trap”. Dept. of Mechanical Engineering, MIT Mysore, Karnataka, India.
[4] Makkar, Harinder & Heuzé, Valérie & Tran, Gilles. (2022). “Locusts and grasshoppers: nutritional value, harvesting and rearing for animal feed, and other applications.” CABI Reviews. 2022. 10.1079/cabireviews202217038.
[5] Kumar, Manoj & Ranjan, Rakesh & Sinha, M & Dhan, Anjali & Naaz, Fahreen & Khanum, Gulfishan & Kumari, Anita & Sharma, Sejal & Raipat, Bharti. (2022). “A Review On Insect Collection And Preservation Techniques.” 9. 233-239.
[6] M, Krishnamoorthi & Seshagiri, S. (2015). “Design and Analysis of Solar Panel with Tilting Arrangement.” 4. 4-438.
[7] Kayode, Makinde, Man Alhaji Sulaiman, Ibrahim Abubakar, And Lawal Olawale. "Design and Retrofitting of A 200 Litres Solar Powered Freezer." (2019).
[8] Ya, Aung & Mu, Aye. (2011). “Design and Analysis of Solar Power System for Sinywa Village in Mandalay Region.”
[9] Halubanza, Brian & Phiri, Jackson & Nkunika, Phillip & Nyirenda, Mayumbo & Kunda, Douglas. (2022). “Toward Locust Management: Challenges and Technological opportunities, Sikaunzwe, Zambia.” Zambia ICT Journal. 6. 61-65. 10.33260/zictjournal.v6i1.152.
[10] Egonyu, J. P., S. Subramanian, C. M. Tanga, T. Dubois, S. Ekesi, and S. Kelemu. "Global overview of locusts as food, feed and other uses." Global Food Security 31 (2021): 100574.
[11] Khalifa, Eman & Essa, Eman. (2019). “Experimental Study for the Effect of Electrocuting Insect Trap (Bug Zapper) on the Spread and Viability of Microorganisms Carried by Musca domestica (House Fly).”
[12] Poulin, Brigitte, Gaëtan Lefebvre, Camille Muranyi-Kovacs, and Samuel Hilaire. "Mosquito traps: an innovative, environmentally friendly technique to control mosquitoes." International journal of environmental research and public health 14, no. 3 (2017): 313.



10.22214/IJRASET

INDEX COPERNICUS
45.98

IMPACT FACTOR:
7.129

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY