VIVA-TECH IJRI
ANNUAL RESEARCH JOURNAL
VIVA-TECH INTERNATIONAL JOURNAL FOR RESEARCH AND INNOVATION
ANNUAL RESEARCH JOURNAL
ISSN(ONLINE): 2581-7280

Solar Powered Grass Cutter & Sprayer

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Abstract: *Agriculture is the most extensive economic sector and plays a crucial role in India's overall economy. For the Indian economy to grow, mechanization is essential. The primary goal of mechanization in agriculture is to enhance both productivity and production. The system is controlled by the PIC18F45K22 Controller, and automation is achieved through the use of sensors and the same controller. DC motors are responsible for the wheel and cutting operations. A DC battery powers the system and supports its standby mode. The entire power supply comes from the battery, which is charged using a dedicated charger circuit. Additionally, for pesticide application, we utilize a water pump equipped with a spreading nozzle. Key Words: Solar Panel, Sprayer, Grass Cutter, Wheel Control, Camera Module.*

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I. INTRODUCTION

Agricultural sector is changing the socio-economic environment of the population due to liberalization and globalization. About 75% people are living in the rural area and are still dependent on agriculture. Agriculture has been the backbone of the Indian economy. Spraying of pesticides is an important task in agriculture for protecting the crops from insects. Farmers mainly use hand operated or fuel operated spray pump for this task. This conventional sprayer causes user fatigue due to excessive bulky and heavy construction. This motivated us to design and fabricate a model that is basically trolley based solar powered Grass Cutter, Pesticide Sprayer & Lighting System in a single unit. Due to use of Solar energy for operating pump & grass cutter, there will be elimination of engine of fuel operated spray pump & cutter by which there will be reduction in vibrations and noise. The elimination of fuel will make our spraying system eco-friendly. Solar powered system can give less tariff or price in effective spraying, grass cutting & Lighting operation. Solar energy is absorbed by the solar panel which contains photovoltaic cells. The conversion of the solar energy into electrical energy is done by these cells. This converted energy utilizes to store the voltage in the DC battery which used to function whole unit. In this project we are using wireless technology for home automation. A home automation system is a means that allow users to control electric appliances of varying kind. The main aim of the project is to develop a system that will control of home appliances. The basic requirement or need is android app because of we are overall home appliances through android app. home automation systems develop to automatically achieve some activities performed frequently in daily life to obtain more comfortable and easier life environment. In home automation that can detect and identify you, automatically adjust the lighting to your predefined taste, open doors automatically, at night and switch them off in the morning, stream to you anywhere in the world via the internet. It is meant to save the electric power and human energy. IoT coverage is very wide and includes variety of objects like smart phones, tablets. Once all these devices are connected to each other, they enable more and more smart processes and services that support our basic needs.

II. METHODOLOGY

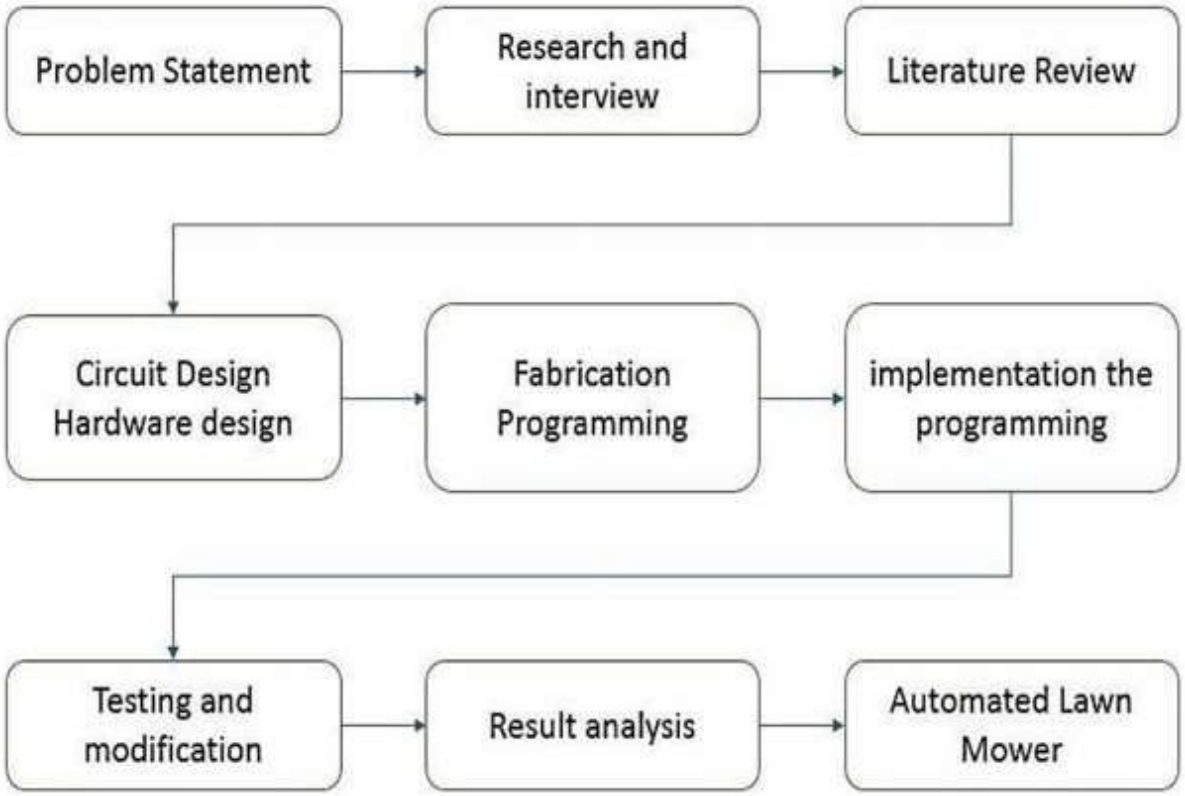

Fig 1. flowchart for proposed methodology

To create a solar-powered grass cutter and sprayer using an Arduino Uno, we have combined several components, including a solar panel, battery, DC motors, motor drivers, a sprayer pump, and sensors. The system operates by harnessing solar energy to power its components. The solar panel charges the battery, which in turn powers the Arduino and other devices. The Arduino Uno manages the grass cutting motor and sprayer pump through motor drivers and relays. An ultrasonic sensor is used to detect obstacles, ensuring that the grass cutter halts if it encounters an object in its path. A light-dependent resistor (LDR) keeps track of the surrounding light levels, allowing the system to function only during the day when solar energy is available, while entering a low-power mode at night. The sprayer pump, connected to a relay, is activated periodically to spray as needed, and the entire system is designed to operate autonomously. The motors control the movement and grass cutting mechanism, while the obstacle detection feature ensures smooth navigation. With these components, you can create a functional solar-powered grass cutter and sprayer system that operates efficiently and autonomously, utilizing renewable energy.

Components Needed:

1. Arduino Uno Solar Panel (to charge the battery and power the system)
2. Battery (12V or 24V depending on your motor and pump requirements)
3. DC Motors (for the grass cutter and movement)
4. Motor Driver (L298N or similar for controlling the motors)
5. Sprayer Pump (12V DC pump for spraying)
6. Ultrasonic Sensor (for obstacle detection and movement control)
7. Wheel Motors (if you want autonomous movement for the grass cutter)
8. Solar Charge Controller
9. Jumper wires and breadboard
10. Chassis (for assembling the motors, pump, and other parts)

3.1 Fabrication & Assembly

Corrosion-resistant materials were used to create a sturdy yet lightweight frame for the manual hand floor cleaner, making it suitable for outdoor use. The sprocket, chain, and gear assembly were securely mounted onto the frame through precise drilling. Chains and sprockets were cut to the correct size to ensure efficient power transfer from the wheels to the mop. Bevel gears were installed to allow the mop to rotate smoothly by transmitting rotational force at an angle. A small water tank with a manual release valve was attached to the frame to distribute water effectively to the mop.

The assembly process began with the construction of a stable frame. The sprocket and chain system were then aligned to connect the wheels to the mop mechanism. The water tank was securely attached, with tubing directed to control water flow, and bevel gears were carefully positioned to avoid any misalignment. Once the assembly was completed, the device was tested to ensure that all parts worked together properly, confirming that the cleaner was effective on muddy and damp surfaces.

3.2 Testing

After assembly, a series of tests were conducted on the manual hand floor cleaner to assess its performance, durability, and efficiency on damp, slippery outdoor surfaces. The alignment of the bevel gear was checked to prevent slipping or jamming during use. Initial tests were carried out to ensure the proper alignment of the chain and sprocket system, which allowed the mop to rotate smoothly as the wheels moved forward. Functionality tests were performed on various surfaces, such as concrete and tiled outdoor areas, to evaluate the cleaner's ability to remove mud, debris, and water effectively. The water distribution system was tested to ensure the proper amount of water was released onto the mop without excessive leakage, enabling effective cleaning of muddy or sticky spots.

Durability tests were conducted by repeatedly using the cleaner in simulated outdoor conditions, exposing it to wet and rough surfaces to observe wear on the chain, gears, and frame. User feedback was gathered through operational tests to assess the cleaner's overall effectiveness, comfort, and ease of use. This ensured that the cleaner could be operated efficiently without excessive force. The tests confirmed that the cleaner's design was reliable, durable, and effective for outdoor cleaning tasks.

III. CONCLUSION

This project marks a significant advancement in the creation of precision autonomous farming systems, responding to the increasing demand for more efficient and sustainable agricultural methods. Aiming to cut down on the time, labor, and effort needed for tasks like pesticide spraying and weed cutting, this system presents a valuable solution for farmers looking to enhance their productivity while reducing environmental impact. Powered by a +12V rechargeable battery, it plays a vital role in boosting efficiency and sustainability. This feature allows the system to operate for extended periods, ensuring continuous functionality without frequent recharging, making it perfect for long hours in the field. The main purpose of this system is to autonomously navigate through fields, pinpointing areas that need pesticide spraying or weed removal. Equipped with advanced sensors, it can accurately identify weed patches or sections requiring pesticide application, ensuring that only the necessary parts of the field are treated. This approach not only saves time and labor but also minimizes chemical overuse, fostering more sustainable farming practices by focusing on problem areas. One of the key benefits of this innovation is its potential to alleviate the labor challenges that farmers face. Traditional methods, such as hand sprayers or tiller-mounted sprayers, are labor-intensive and time-consuming, demanding considerable manual effort to cover large areas. In contrast, this autonomous system can operate continuously and independently, allowing farmers to dedicate their time to other essential tasks. By reducing the need for manual intervention, the system also helps lessen the physical strain on workers and decreases the risk of injuries linked to repetitive manual tasks. Additionally, the use of a rechargeable battery boosts the overall efficiency of the system, decreasing reliance on fuel or external power sources. Since the system runs on renewable energy and utilizes a battery, it promotes a more sustainable approach to farming.

Acknowledgements

We would like to sincerely thank Mr. Suneet Mehta our supervisor, for his essential advice, perceptive criticism, and unwavering support during this project. Additionally, we would like to express our gratitude to the Principal, Dr. Arun Kumar, and the Viva Institute of Technology, Virar, for providing us with the facilities and resources needed to carry out this study. Special thanks go to Dr. Niyati Raut, Head of the Department of Mechanical Engineering, for her invaluable guidance, constant encouragement, and insightful feedback, which greatly contributed to the advancement of this research.

We also want to express our heartfelt gratitude to our families for their unwavering encouragement, patience, and support throughout this journey. Finally, we give thanks to God for giving us the strength, perseverance, and motivation required to successfully complete this study

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