

FABRICATION OF WIRELESS OPERATED SOLAR PESTICIDE SPRINKLER

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ABSTRACT

Agriculture is a profession of many tedious processes and practices, one of which is the spraying of insecticides in the vineyards. A typical vineyard requires extensive spraying every 4-5 days in the summer and every 3-4 days in the rainy season. The conventional methods are: a person carrying a sprinkler and manually actuating a lever to generate pressure and pump the pesticide through a tube or a mobile vehicle carrying an inbuilt compressor and sprinkler unit which has to be manually driven by a human operator. These methods are fuel consuming and susceptible to human errors. Another major drawback in human operated systems is that the operator is exposed to the harmful chemicals while spraying. Long term exposure, as in this case, can be extremely detrimental to the operator's health. This is a project which can be viewed as a viable alternate to these methods.

Keyword: - Solar Panel, Renewable Energy, Agriculture, Microcontroller, Battery, etc....

1. INTRODUCTION

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 sprinkler 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 sprinkler. In our design, here we can eliminate the back mounting of sprinkler ergonomically it is not good for farmers health point of view during spraying. In this way here we can reduce the users fatigue level. There will be elimination of engine of fuel operated spray pump by which there will be reduction in vibrations and noise. The elimination of fuel will make our spraying system eco-friendly. So with this background, we are trying to

design and construct a solar powered spray pump system.

Now days there are non-conventional energy sources are widely used. The energy which is available from the sun is in nature at free of cost. In India solar Energy is available around 8 months in year .so it can be used in spraying operation. Solar pesticide sprinkler can give less tariff or price in effective spraying. 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 and that battery further used for driving the spray pump.

The reference number should be shown in square bracket. However the authors name can be used along with the reference number in the running text. The order of reference in the running text should match with the list of references at the end of the paper.

1.1 Problem Statement

- In the backpack spraying / solar operated sprayer the labor has to carry all the weight of the pesticides filled tank which causes fatigue to labor and hence reduces the human capacity.
- The engine operated spraying equipment needs fuel for its running and proper operation which increase its operational cost and also its gives the back pain due to vibration problem.
- In the aerial spraying wastage of fertilizer and some crops are not totally covered and also not suitable for small farms.
- During spraying after sometime hand muscles starts to pain and thus proper pressure is not maintained. So, it affects the droplet pressure.
- When using fuel operated vehicles the exhaust gases liberated from the Silencer or muffler produces a harmful effort over the crops

1.2 Objective

- To Design and develop an agricultural fabrication system which can be able to pesticing, spraying and seeds like operations carried out in agricultural field.
- To control of this agri-robot should be wireless and can be able to show above operations.
- Analyze the design of spraying tool and develop for real time system.
- To propose a low cost but effective real time agri system.
- To decrease the operational cost by using new mechanism.
- To decrease labor cost by advancing the spraying method.
- To increase the productivity of the crops.
- To save the time of the farmers.

2. LITERATURE REVIEW

1. Monowheel Operated Pesticide Spraying Machine.

Dr. R. N. Panchal Sir, Mr. Nikhil Deshmukh, Miss. Poonam Shahapure, Miss. Mrunalini Patil, Miss.Ashwini Kengale.

In this research paper, Everyone know that India has known for an agricultural based country approximately 75 % of population of India dependent on farming directly and indirectly and we know that our farmer using the same old methods and equipment. E.g. seed sowing, spraying, weeding etc. There is need for development of effective spraying. In the world of specialization of mechanization, it is essential to introduce new machine and techniques for the improvement and advancement of living standard of human being. A reciprocating pump is a mechanical device which converts mechanical energy into hydraulic energy and transfers same to the liquid through the pipe line thereby increasing the energy of the flowing liquid. Hence we introduced this new pesticide spraying machine for the ease of farmers. It reduces the human efforts and it is easy to handle.

2. DESIGN AND FABRICATION OF A SOLAR SPRAYER.

S.Charvani, K.Sowmya, M.Malathi, P.Rajani, K.Saibaba.

In agriculture sector, spraying of pesticides is an important task to protect the crops from insects for obtaining high yield. However, farmers have been mainly using traditional conventional techniques like hand operated and fuel operated sprayer system for spraying pesticides. Fuel is expensive and in many places fuel may not be available. If hand operated spray systems are used, the labor productivity decreases and the efficiency will be low. The use of solar energy system is an alternate solution for these limitations. Hence, a solar powered agricultural pesticide sprayer is designed and fabricated. The system was designed and fabricated by considering parameters like desired spraying capacity, low weight, low cost, user-friendly nature, high operating time and for faster coverage of area. Thus, the solar sprayer was fabricated to be a value for money product in the agricultural sector. For designing the prototype, the conventional sprayer system was studied to understand the mechanism for spraying process. Mathematical models were developed after adopting suitable assumptions for calculation of power of the motor required for spraying a known quantity of fluid. The parts required for the system were selected by solving for known input values and considering their availability in market. The system was fabricated and arrangements were made on the system to make it portable and to allow the user to carry it on his back while in operation. The system was fabricated according to the design parameters and field tested according to the standard test conditions.

3. Design and Development of Multipurpose Pesticides Spraying Machine.

Shailesh Malonde, Shubham Kathwate, Pratik Kolhe, Roadney Jacob, Nishat Ingole, Rupesh D. Khorgade.

In this Research Paper, As India is agriculture based country and 70% people do farming and related work. Agriculture is required to be boomed to enhance the Gross Domestic Product (GDP) of the country by improving the productivity. The productivity of the crops can be increased with the help of pest control. Pesticide spraying is the necessary procedure in cultivation of the crops. The present idea deals with the designing and fabricating a pesticide sprayer which will be useful and affordable to the farmers which will assist to increase the productivity of crops. Though this project an attempt has been done to improve the method of spraying the pesticide that will enhance the productivity and increase the farmer's income. So we have designed a pesticide spraying machine which will not only increase productivity but also will reduce the effort of the farmers. The machine will save the time of the farmer as well as efficiency in spraying. This model carries multi nozzle pesticides sprayer pump which will perform spraying at maximum rate in minimum time. Constant flow valves can be applied at nozzle to have uniform nozzle pressure.

4. Design and fabrication of agriculture weeder.

Mane Deshmukh Vijay, Bhoir Nilesh, Ghade Tushar

This work our team make agricultural equipment which is useful for farmer, this equipment is known as weeder cycle. In India most of people are farmer. For doing fieldwork maximum human power is used, but some present year's needs of workers are necessary but availability of workers are less for field work. So we will make rotor adjustment cycle. These weeder cycle is design by using inverter software. These weeder cycles will remove grass between two rows. It will remove multiple grasses in less time, so work will more complicated in less time. Therefore less workers are required for remove grass.

5. Design and Fabrication of Solar Operated Sprayer for Agricultural Purpose.

Akshay M. Narete, Prof. Gopal Waghmare

Today's Energy Demand is the great challenge for our Society. Conventional Energy (fossil fuel, coal, nuclear energy etc.) can be widely used in India such as Textile industry, Power plant etc. using Conventional Energy there are many Exhaust that can be come out after pollutant which is harmful to our Environments, In Such situation we should move towards some Non-conventional energy (Solar energy, Wind energy, Tidal energy) Non-conventional becomes very popular for all kinds of developments activities such as drying agriculture product, irrigation purpose and for spraying purpose, In this paper we are trying to make unique equipment for cultivation users. My contribution on my project is that from enquiry on 20 farmer I can collect data regarding spraying and how exactly farmer can facing problem while spraying. 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 fabricated a model that is basically trolley based solar sprayer In our project here we can eliminating the back mounting of sprayer because Ergonomically it is not good for farmer health point of view during spraying in this way here we can reduce the users fatigue level.

6. Agricultural Sprayer Vehicle with Router Weeder and Seed Sower.

Prof. N. R. Jadhao, Chinmay Kadam, Haider Gazge, Rahul Dhagia, Nikhil Kalpund.

The spraying is traditionally done by labour carrying backpack type sprayer which requires more human effort. The weeding is generally done with the help of Bulls becomes for small land farmers. Similarly the seed sowing application is also done with the help of bulls, which in the present age is time consuming and laborious. So to overcome these above problems a machine is developed which will be beneficial to the farmer for the spraying and weeding operation along with the seed sowing application. A multifunction device will come in handy that can be put to use in different stages of farming as per requirement.

3. WORKING

In the proposed system can be operated through android mobile. In android mode the android mobile phone uses Bluetooth as a communication media to operate the robotic system. The user sends the commands from the android mobile app. The Bluetooth module connected to the control unit receives commands from the mobile phone. The control unit will process those commands and operate the motors of the robot and the sprinkler motor through driving circuits. The user can perform two control operations on the system, Robot Motion Control and Pesticide Flow Control. User control the robot motion in four directions: front, back, left and right. The pesticide flow quantity can be set by the User by controlling the speed of the sprinkler motor in the sprinkler system. The sprinkler motor speed is controlled by using the concept of PWM. The control unit process those commands and drives the dc motors that control the Movement of the robotic system and the sprinkler motor that control the quantity of pesticide. For Grass cutting Grass cutter attached at the bottom which is controlled by mobile. It uses solar energy to operate. First the solar energy is absorbed by the solar panel. This solar energy is then converted into electrical energy by the photovoltaic cell. Here buck and boost converter is used to supply a required voltage from solar panel to the battery. To spray the pesticides a 12v, 2.1amp DC motor is required. DC motor is driven by the 12v 8AH battery. Motor consists of one inlet & one outlet. Inlet opening is connected to pesticide tank and outlet is connected by the sprayer nozzle. Motor creates the suction & helps to spray the pesticides to the crops, Pesticide tank is having capacity of 12 liter. Different types of nozzles are used for different kind of spray for example F nozzle, taper nozzle, sector nozzle.

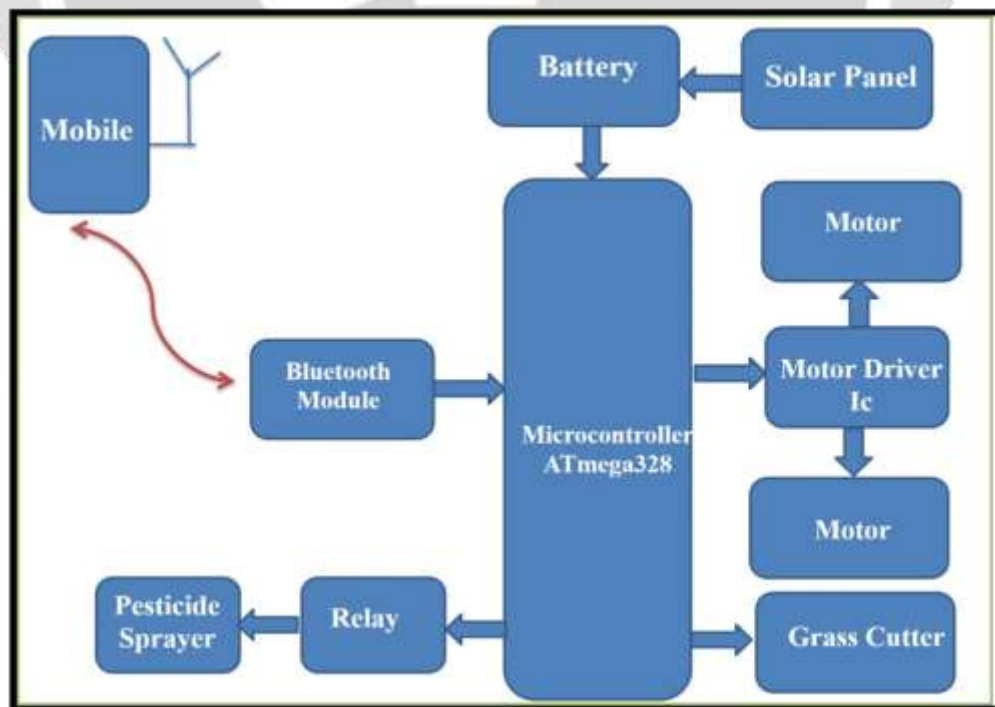


Figure- 1 Block Diagram

3.1 Components lists

- Solar panel
- IC-7805
- Gear motor
- Microcontroller

3.1.1 Solar Panel

Energy comes in different forms. Light is a form of energy. So is heat. So is electricity. Often, one form of energy can be turned into another. This fact is very important because it explains how we get electricity, which we use in so many ways. Electricity is used to light streets and buildings, to run computers and TVs, and to run many other machines and appliances at home, at school, and at work. One way to get electricity is to burn a fuel like oil or coal. This makes heat. The heat then makes water boil and turn into steam.



Figure- 2 Solar Panel

3.1.2 IC-7805

7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply.

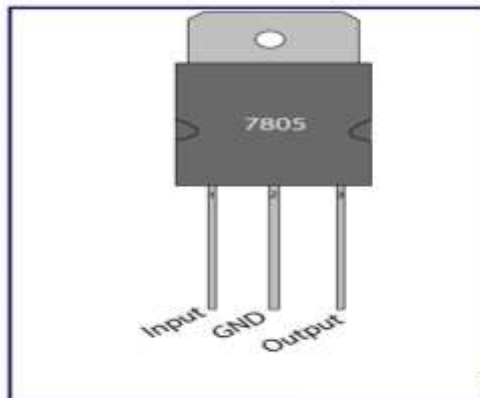


Figure 3 IC-7805

3.1.3 Gear Motor

Permanent magnet DC gear motors have a unique performance advantages that make them the best choice for simple, high efficiency DC drives. Permanent magnet DC motors features die cast end bells and ball bearings for long life and optimized heat transfer. Custom windings can be tailored to your specific needs and Encoders and electrical noise suppression can be added, if required.



Figure- 4 Gear Motor

3.1.4 Microcontroller

The ATmega8 provides 8 Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 512 bytes of EEPROM, 1 Kbyte of SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible Timer/Counters with compare modes, internal and external interrupts, a serial programmable USART, a byte oriented two wire serial interface, a 6-channel ADC (eight channels in TQFP and QFN/MLF packages) with 10-bit accuracy, a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and five software selectable power saving modes.

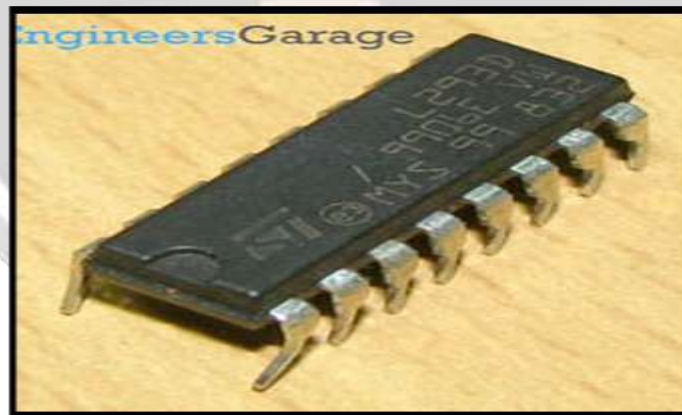


Figure- 5 Microcontroller ATMEGA 8

4. ADVANTAGES

- It is one of the latest and sophisticated systems.
- It controls whole system automatically.
- It is reliable and requires less maintenance.
- It is Affordable.

- The system working is simple and easy to use.

5. APPLICATIONS

- The system or robot can be mainly use in agricultural field.
- It is used in home gardening.
- It is used in sports ground
- It is used in fruit gardens.

6. CONCLUSIONS

This project demonstrates the implementation of robotics and mechatronics in the field of agriculture. This being a test model the robustness of the vehicle is not very high. The performance is satisfactory under laboratory condition. The model gave a fairly good rate of area coverage and the cost of operation as calculated was also reasonably low. In addition the safety and long term health of the farmers is ensured by eliminating human labour completely from this process. It does not compromise the performance of a petrol based pesticide sprayer.

7. ACKNOWLEDGEMENT

The Existing system does not have minimum requirements for human needs such protection from pesticides regarding health issues, consumption of solar energy, no fuel consumption, does not create any pollution and so on. In this project the above requirements are fulfilled with the advanced technology by sending instructions with the Bluetooth device and this project provides greater advantage in future.

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