



## Design And Development Of Solar Operated Pesticide Spraying Vehicle

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**Abstract** - Manual spraying of pesticides and herbicides on crops is quite a laborious work. Manual trimming of unwanted plants or harvested crops from field is also difficult. Our project proposes a multipurpose solar powered semiautomatic remote controlled vehicle with three-way adjustable chassis (i.e., the height, length and width) and plant mowing equipment. It is designed to spray pesticides directly on crops with minimum wastage and making it cost effective and environment friendly. With adjustable chassis it is suitable for many crop fields. Alternatively, it can also be used for watering gardens, maintaining lawns and in pandemic situations like covid-19 for spraying of sanitizer in hospitals. With the use of solar power for charging the battery we tried to reduce the dependency on grid power. Our project reduces noise pollution and is environment friendly as it uses electric power to operate pump instead of petrol or diesel motors. The device is operated through an application on mobile and bluetooth is used for connection. Automation in Indian agriculture industry will greatly help our country in development.

**keywords** – agriculture, adjustable chassis, environment friendly

### 1. INTRODUCTION

In India most of the rural population depends on agriculture to earn their livelihood. The present farming methods are highly labor intensive. The availability of labours is reducing continuously with increase in wages. Hence there is requirement of a system to overcome this problem. As much as India depends upon the agriculture. Still it is far from adapting latest technologies to get good result. Developed countries have already started using UAVs in their precision agriculture, photogrammetry and remote sensing. In India many agricultures related works are still done manually by humans and pesticides spraying is one of them. Traditionally it is done by backpack type sprayer which required human efforts or by using electric pump. The project will help improve agriculture system and to reduce human efforts. The equipment utilizes renewable energy sources (Solar Energy) which is eco-friendly. The solar panel gives out electric supply to system and the bluetooth control transmitter and receiver minimize drudgery of farmer.

### 2. LITERATURE REVIEW

Table 1 literature survey

Sr No.	Name of author	Date of publication	Title of research paper	Result
1	Kiran Kumar B M, M S Indira, S Nagaraja Rao Pranupa S	March - April 2020	Design and Development of Three DoF Solar Powered Smart Spraying Agricultural Robot	The design and development of a solar powered, remotely operated three degrees of freedom pesticide spraying robot for use in agriculture is presented in this paper. The prototype gave a fairly good rate of area coverage with a reasonably low operating cost

2	Pvr Chaitanya, Dileep Kotte, A Srinath, KB Kalyan	2020	Development of Smart Pesticide Spraying robot.	In this paper, a depth measurement method for detecting pests on leaves is proposed, And it provides pestes position for automatically spraying pesticide on the leaves where the pest model pasted on.
3	Ege Ozgul, Ugur Celik	2018	Autonomous anti -pesticide spraying and insect repellent mobile robot for agriculture application.	Main goal of this project is to design, fabricate, program a low-cost mobile robotic system to perform pesticide spraying and insect repelling tasks in the feild efficiently without seeking any human interaction during operation.
4	Harshit Jain, Nikunj Gangrade, Sumit Paul, Harshal Gangrade, Jishnu Ghosh	March - 2018	Design and fabrication of Solar Pesticide sprayer	It is observed that, this model of solar powered pesticide sprayer is more cost effective and gives the effective results in spraying operation. As it runs on the non-conventional energy source i.e. solar energy, it is widely available at free of cost
5	Vijaykumar N Chalwa, Shilpa S Gundagi	7 JULY 2014	Mechatronics Based Remote Controlled Agricultural Robot	The robot for agricultural purpose an Agrobot is a concept for the near the performance and cost of the product once optimized, will prove to be work through in the agricultural spraying operations.
6	Binod Poudel, Ritesh Sapkota, Ravi Bikram Shah, Navaraj Subedi, Anantha Krishna G.L	July -2017	“Design and Fabrication of Solar Powered Semi Automatic Pesticide Sprayer	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. In addition, the safety and long-term health of the farmers is ensured by eliminating human labor completely from this process. It does not compromise the performance of a petrol based pesticide sprayer

### 3. CURRENT SITUATION OF ROBOTICS

Twenty first century is an era of modernization. Automation is being done in almost every field of work, let it be manufacturing, transport, IT industry or agriculture industry. There are various new techniques are being use in agriculture such as UAVs, photogrammetry, and remote sensing. The demand for robot in every field is very high. In next few years robots are going to be used in every field. But the problem of using a autonomous robot in agriculture is the navigation of robot through field. Each crop is of different height, each crops field orientation is different so it very difficult to navigate through it. Automated robots are easier to use in green house sheds where the working area is small and with the help of tracks or programming a robot to move on fixed path it can easily navigate. With the use of sensors like ultrasonic sensors, photoelectric sensors we can over come this problem. With advance development in artificial intelligence, it will be easy to use fully automated robots in agriculture field.

### 4. PRESENT METHOD –

Presently spraying is done with the help of traditional backpack sprayer. Drawbacks of backpack sprayer is that it is a heavy equipment. It causes many back related problems when use for longer period. The second drawback is that the direct exposor of pesticides to worker which is very dangerous and can cause diseases like skin cancer.

### 5. PROPOSED METHOD –

Proposed model reduces the drudgery of farmer as it uses semiautomatic robotic vehicle. It uses a mobile application and bluetooth for connection to control the spraying operation and movement of the vehicle. This will reduce the exposure of chemicals as it can be operated from safe distance.

### 6. ROBOT SPECIFICATIONS

Table 2 robot specifications

Item	Specification
Robot dimensions (adjustable)	(50cm x 50cm x 150cm) to (100cm x100cm x 150cm)(LxWxH)
Weight	8 kg
Drive system	4 wheeled drive system
Power supply	12 V lead acid rechargeable battery
Ground clearance (adjustable)	40cm to 70cm
Payload	12 kg



Fig 1 HC-05 bluetooth module



Fig 2 Relay motor driver

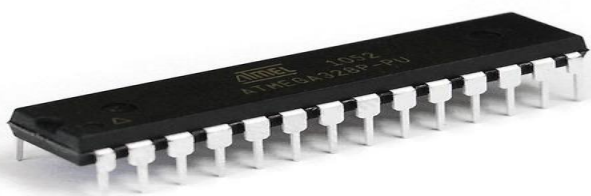


Fig 3 889C052 microcontroller

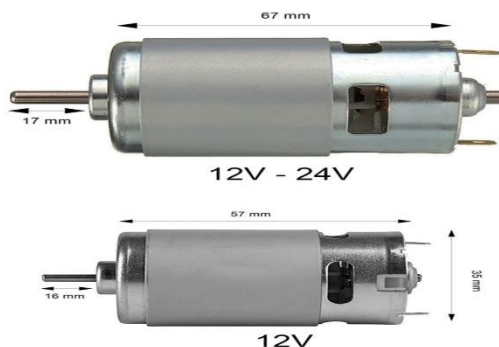


Fig 4 12V DC motor

Table 3 Navigation systems components



Fig 5 12V 5PSI pesticide pump



Fig 6 Boom nozzle

Table 4 Spray system components

### 7. METHODOLOGY

Switch on the power supply of the vehicle. The indicator on bluetooth module will start blinking. Open the application on smartphone. Start scanning for nearby bluetooth devices on the application. Select and pair the smartphone with bluetooth module of the vehicle. Once connected successfully the blinking of indicator will stop and device is ready to use. With the help of various commands such as move forward, move backward, turn right, turn left, start spray we can easily operate the vehicle.

## 8. WORKING PRINCIPLE

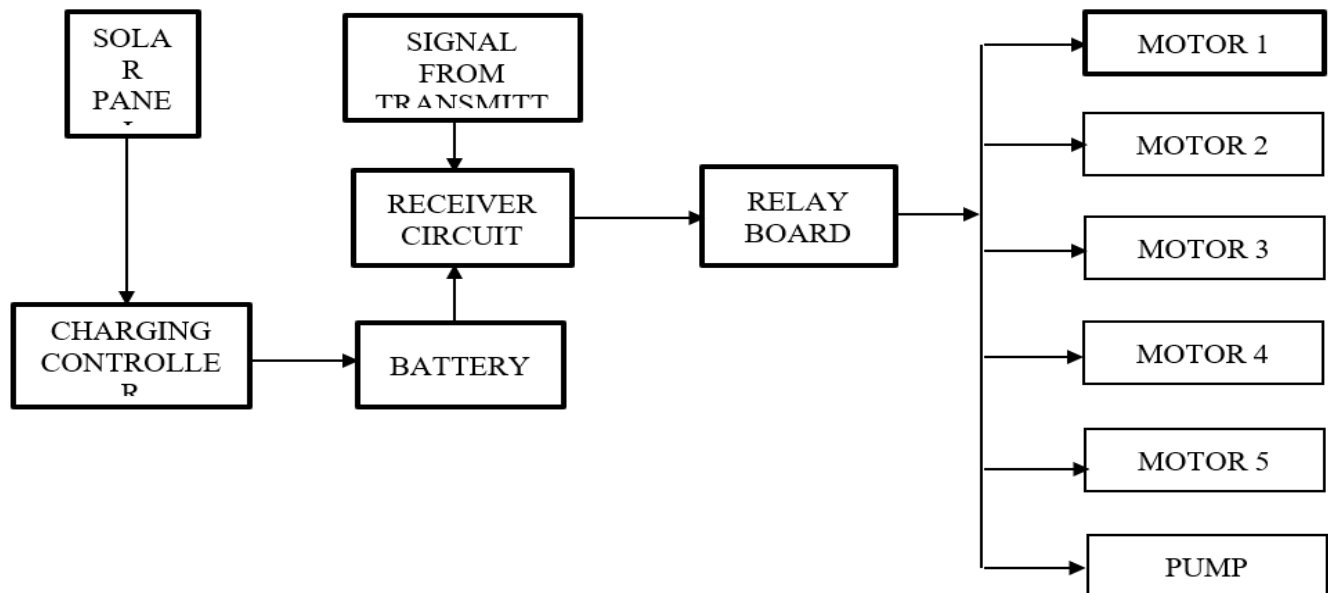


Fig 7 Circuit diagram

## 9. WORKING

When we switch on the power supply the microcontroller got actuated and bluetooth module starts blinking means its ready to pair. We have to pair the device with smartphone through an application which is easily available on play store. Once paired it is ready to use. As it is a 4-wheel drive when given a command of FORWARD all four wheels will start rotating forward and similarly when BACKWARD command is given all wheels will start rotating backwards. While turning RIGHT the wheels on right will rotate backwards and wheels on left side will rotate forward similarly while moving to LEFT the wheels on left will rotate backwards and wheels on right side will rotate forward. With the use of application, we can start or stop the pump.



Fig 8 Solar operated pesticide spraying vehicle

## 10. FUTURE SCOPE AND SIGNIFICANCE

In 21<sup>st</sup> century modernization is necessary to cope up with increasing population and increasing demand. In coming years robots are going to be use in every field so why not agriculture as it is one of the basic need of human being. We can make the system future proof by using advanced components such as automatic actuators to increase the height if sprayers and instead of bluetooth we can use GSM so we can operate the vehicle from any part of the world. The project has very bright future scope as it will reduce the workload of farmers and make farming efficient.

## 11. RESULT

the project is more economical than traditional backpack sprayer. It reduces noise pollution with the help of using electric pump. It reduces air pollution as it uses solar power for operation. It reduces many health related problems including back problems and skin diseases due to continuous exposure to chemicals. It reduces drudgery of farmer with the use of wireless controlling.

## 12. CONCLUSION

Proposed system is user friendly as well as environment friendly as it uses solar power for operation instead of fuel. It can be used in field effectively. This system can be used in remote places where power and fuels are not available. It is economical than traditional backpack sprayers as the prices of fuels are continuously rising.

### 13. REFERENCE'S

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