

MULTIPURPOSE PESTICIDE SPRAYING AND GRASS CUTTING MACHINE

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ABSTRACT

Rapid growth of various high-tech tools and equipment makes our jobs done comfortable and sophisticated. Due to the continuous increase in the cost of fuel and the effect of the emission of gases from the burnt fuel atmosphere, this necessitated the use of the abundant solar energy from the sun as a source of power to drive a **Grass Cutter and Pesticide Sprayer**.

A Solar Powered Automatic Grass Cutting and Pesticide Spraying machine project is mainly proposal for reducing the direct human interaction with chemical and usage of electricity. Solar plate is employed to produce the supply to the battery charging, which is less complicated to use, additional advantage compared to alternative energy supply such as fuel this energy is a renewable source of energy.

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. 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. This is very time consuming and laborious. Through 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.

Keywords – Pesticide Sprayer, Grass Cutter, Solar Plate, Chemical.

1. INTRODUCTION

Agriculture is the backbone of our nation. In agricultural sector about 70% of people are living in the rural area and they are still dependent on agriculture. So, the economical level of our nation is maintained by the production level of an agriculture products. The modern agriculture has the advanced cultivation equipment that play a vital role in improving the productivity. In ancient days of the agriculture field there is no special form of machines. But now a days there are many innovators are introduced in the cultivated machines. The machines reduce the effort of the human being. Spraying of pesticides is an important task in agriculture for protecting the crops from the insects. Farmers mainly use hand operated or fuel operated spray pump. This motivated us to design and fabricate a model that is basically a solar powered based Grass Cutter and Pesticide Sprayer 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 and will make our spraying system Eco-Friendly.

In our project we are using wireless technology i.e., Bluetooth module. The project aim is to remove the backpack and foot spraying techniques, eliminate the human efforts, to decrease labour cost by advancing the spraying method and adding more operation in a single machine with eco-friendly energy source.

2. LITERATURE SURVEY

2.1 CAM OPERATED AGROCHEMICAL PESTICIDE SPRAYER (January 2017) [1]

Idea proposed by Rajashekhargoud Angadi, Rohit L G, Satish Changond, Santosh Kagale

The Agrochemical are widely used for controlling agriculture crop disease, insects and weeds etc. the farmers are able to save an agriculture crop from pest attack to improve the more growing of crop applications. The agrochemicals are costly and to design the agrochemical pesticide equipment with lower cost for small farmers and big farmers. This model has removed the problem of back pain, since there is no need to carry the tank on the back.it has more number of nozzles which will cover maximum area of

spraying in minimum times and at maximum rate. The utilization of kinetic energy of bicycle to hydraulic energy by using camera operated piston pump. The camera operated piston pump is a light duty component capable of spraying a high pressure of fluid through nozzle. The camera operated agrochemical pesticide sprayer reduces man power for operation. For a shorter period of time farmers can cover the more hector of agriculture land.

2.2 DESIGN AND FABRICATION OF MULTI NOZZLE WHEEL SPRAY PUMP [2]

Idea proposed by Mr. Abhishek Bhashkar, Mr. Subhash Tiwari & Prof. Prashant

Day by day the population of India is increasing and to fulfil the need of food modernization of agricultural sectors are important. Due to chemical fertilizers the fertility of soil is decreasing. Hence farmers are attracted towards organic farming. This model is removed the problems back pain, since there is no need to carry the track on the backbone and solder. Proper adjustment facility in the model with respect to crop helps to avoid excessive use of pesticides which result into less pollution. It is cost effective than the existing spraying pumps available in the market as no direct fuel cost or cost for maintenance is needed for this. It is upgraded design of manually operated sprayer and weeder which will be helpful for small land farmers. It consumes less time and saves money as compared with conventional spraying and weeding. This machine does not require any fuel or power so maintenance is less.

2.3 SOLAR POWERED GRASS CUTTER AND SAFETY PESTICIDE SPRAYER 09 (April 2018) [3]

Idea proposed by Sharad Phuse, Madhav Jaiwal, Rahul Wayal, Avinash Naphade, Vijaykumar Jadhav

Solar powered automatic Grass Cutter, this is lawn mower or grass cutter. This is made up of an induction motor, a battery, an alternator, collapsible blades, and a link mechanism. Solar energy is radiant light and heat from the sun harnessed using a range of ever-evolving technologies. A solar electric array generates electricity from the sun's light with no moving or wearing parts. A solar pump is utilizing the direct current from the array efficiently even as the energy production varies throughout the day. The solar energy is generated due to solar panel and the energy is stored in battery, which converts the solar energy into the electrical energy. The blade with dc motor connected to the battery. This solar grass cutter cut all utter cut all types of grass and spraying pesticide on crops.

2.4 MULTIPURPOSE PESTICIDES SPRAYER PUMP06(June 2018) [5]

Idea proposed by Mr. Swapnil Thorat, Mr. Jagdish Pathare, Mr. Vinayak

Multiple pesticide sprayer pumps are combination of both knapsack & Battery-operated pump for better efficiency. This one is trolley operated system by using this we can reduce maximum effort required for spraying Pesticides as well as we can Spray Pesticides in any direction or around the crops at any height of crops. This is used for weeding, plugging etc. This paper suggests a model of manually operated multi nozzle pesticides sprayer pump which will perform spraying at maximum rate in minimum time.

The scope and objective are to - Decrease the operational cost by using new mechanism, Work reliably under different working conditions, Decrease the cost of machine, Decrease labour cost by advancing the spraying method, Machine can be operated in small farming land (5 acre), Making such a machine which can be able to perform both the operation (spraying and weeding), Maximum area of spraying in minimum time, Proper adjustment facility with respect to crop size & height, Attach the multiple nozzle & trolley, Number of instrument can added such as pilling, hilling, ploughing, System is eco-friendly by using a spray guard for spraying .

The equipment is purposely design for the farmers having small farming land say 5-6 acre. It is suitable for spraying as well as weeding at minimum cost for the farmer so that he can afford it. The equipment will result more beneficial when it is subjected to moist soil for weeding purpose, due to moist soil the weed cutter can easily penetrate and dig out the soil and hence will easily accomplished the weeding process. The performance of the equipment will increase when it is operates on the smooth surface or less uneven surface and also it will be more effective when it is used on the crops having nearly similar height and having the less space between two crops.

2.5 SOLAR BASED GRASS CUTTER MACHINE [6]

Idea proposed by Mr. Ritesh Patil, Mr. Shubham Bhad, Mr. Hemant Avasarmal, Prof. Sachine R. Maheshri

Due to the continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitates the use of the abundant solar energy from the sun as a source of power to drive a lawn mower. This project provides a design method of an automated grass cutter operated on solar power. Whose task is to cut grass with no need of user interaction. This task is expected to be made possible by using sensors to provide an Arduino with controlling. The obstacle is automatically

avoided, here for obstacle avoidance the ultrasonic sensor is used. The system also provides power backup by using inverter. The proposed system will be cost efficient with higher reliability.

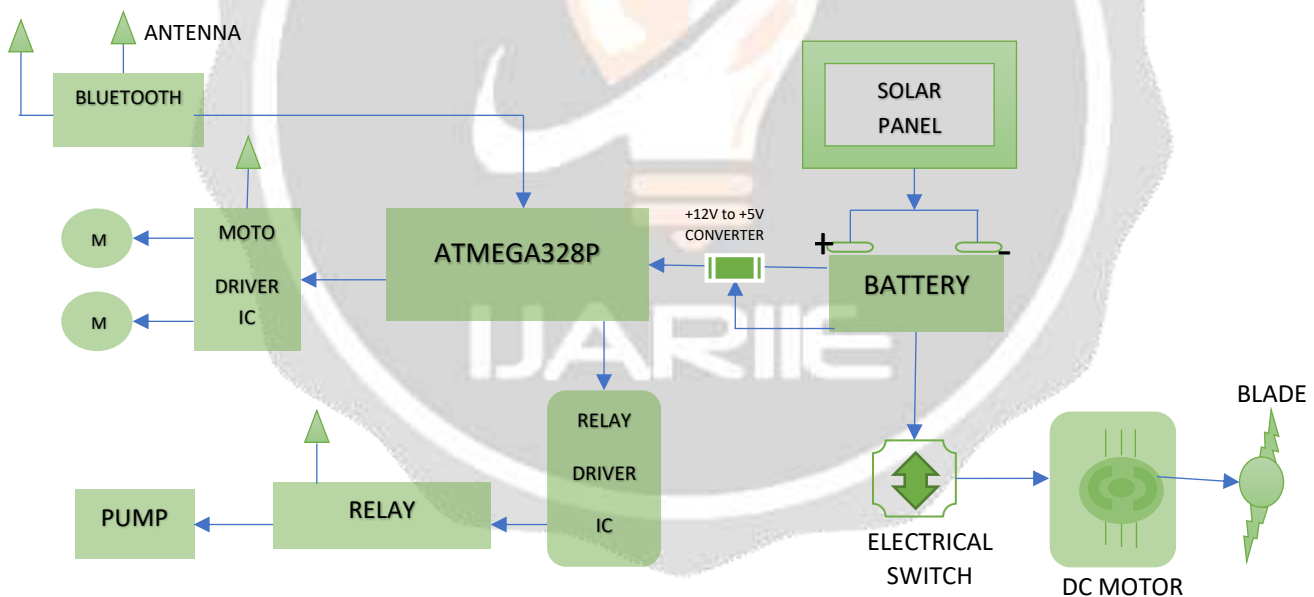
The system will have some automation work and other obstacle detection. The system it has a power sources that is battery and a solar panel will be attached on the top of the robot. Moving the grass cutters with a standard motor-powered grass cutters is an inconvenience. Cutting grass cannot be easily accomplished by elderly, younger, grass cutter moving the engine create noise pollution due to the loud engine, and local air pollution due to the combustion the engine. Also, a motor-powered engine requires periodic maintenances such as changing the engine oil. Even though electric solar grass is environmentally friendly, they too can be an inconvenience. Along with motor powered grass cutter, electric grass cutters are also hazardous and cannot be easily used by all. Also, if the electric grass cutter is corded. Moving could prove to be problematic and dangerous. The prototype will also be will be charged from sun by using solar panels.

2.6 MULTI-TASKING AGRICULTURAL MACHINE TOOL [11]

Idea proposed by Shetabh, Manish Kashyap, Yash Yadav, Ashutosh Singh, Dhruv Kumar

The top concentration of this design is the cost and operational ease in case of small farm units. This multipurpose agro equipment is thus designed to reduce the cost of harvesting, spraying and seed feeding. In the development of multipurpose agro equipment they utilized the past data and techniques. In this way the design of multipurpose agro equipment is safe. Such human powered machine systems will help to a great extent in improving the production per acre and increase profitability of small and middle-class farmers. A new type of multipurpose mechanism is proposed which is different from other machines and will work on non-conventional energy source which is purely human operated.

3. BLOCK DIAGRAM



4. WORKING

In this project the main part is the Atmega328P microcontroller which control the all assembly of project. The user controls the desired command to the “Arduino Bluetooth RC” application installed in the android phone that is connected through Bluetooth via Bluetooth module.

The command is converted to an array of strings and the string is passed to the Bluetooth module, the module receives the message, the command sent will be extracted and executed by the microcontroller attached to it and depending on the commands fed to the motor driver, the motors will function accordingly.

The system will interpret the commands and controls the machine accordingly via android application. Meanwhile, the solar panel will also move by the commands given by the user to charge the battery. The sunlight falling on the solar plate will charge the battery, once the battery is fully charged the will machine work properly.

The blade of the machine is handmade design the motor used for the cutter is the brush less dc motor.

Also, the second application is the pesticide spraying, here we use the pump with the spraying nozzle connected at the both ends of the pipe. For supplying and storing pesticide/water or any other chemical we use the water tank of 2 litre.

The Arduino Bluetooth RC have commands which we are using to control the machine. There are four commands that helps to move the machine in forward, reverse, right and left direction. It also has two more controls to start and stop the spray of pesticide. Another Switch will start and stop the grass cutter. Another added feature of this machine is adjustable rod which can be used to change the height of spraying rod. This will help in spraying pesticides on plants with different heights.

The solar panel also change its direction according to the direction of sun rays. The LDR sensor connected to the solar panel will detect the direction of sun and the solar panel will change its direction accordingly. This will ensure the constant charging of solar panel and will help in proper working of machine throughout the day.



Fig: - Multitasking Agriculture Machine Model

5. COMPONENTS USED

5.1 ATmega328P

The ATmega328P is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core. Atmega328 microcontroller is used in basic Arduino boards i.e., Arduino UNO, Arduino Pro Mini and Arduino Nano.

The high-performance Microchip Pico Power 8-bit AVR RISC-based microcontroller combines 32 KB ISP Flash memory with read-while-write capabilities, 1024B EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented Two-Wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.



Fig: - ATmega328P

5.2 Bluetooth Module

Bluetooth HC05 is an easiest to use Bluetooth serial port protocol module, designed for transparent wireless serial connection setup. The HC05 Bluetooth module can be used in a master or slave configuration, making it great solution for wireless communication.

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default, the factory setting is SLAVE. The role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices.



Fig: - Bluetooth Module

5.3 L293D (Motor Driver IC)

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

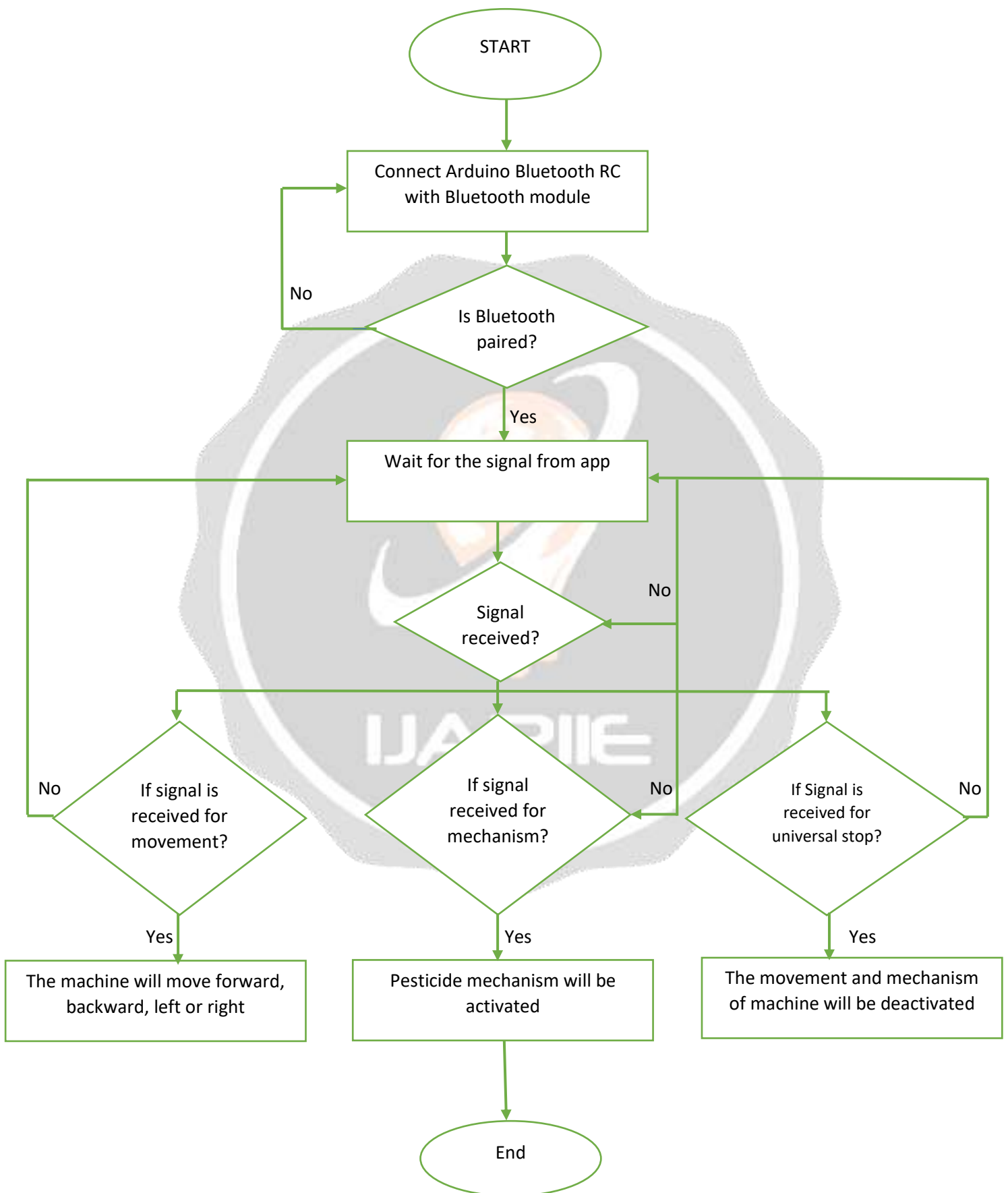
In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.



Fig: - L293D (Motor Driver IC)



6. FLOW CHART



7. OBJECTIVE

- To reduce human efforts which in result reduces the fatigue load on farmers.
- To reduce overall time for the agriculture spraying and also grass cutting.
- Use of multi-nozzles in order to spray large areas at a faster rate.
- This all operate the mechanical on the trolley with Blue-Stick app.
- The purpose of grass cutter is to avoid energy crisis and human efforts. Also, Solar based grass cutter keeps the environment clean and healthy.
- We need not to take precautions like facemasks and gloves against the hazardous chemicals.
- Easy to operate by unskilled workers.

8. ADVANTAGES

- The pesticide sprayer operates with minimal pollution.
- Low power consumption.
- Non-conventional energy is used for charging the battery.
- Flow from nozzle is continuous and at variable height.
- Power is supplied to motor directly from batteries. Hence there will be no fuel required.
- When solar rays are not available at that time battery can be charged by electric charger.
- Vibration free machine.
- Limited human contact with chemicals.
- Height of nozzle is adjustable.
- Its cost is less than electrically operated pump.

9. DISADVANTAGES

- Battery is operated up to limited hours.
- Since, sensor and actuators are not employed. So, when there any obstacle comes, manual interference is required.
- Precision of grass cutter blade may reduce due to excessive use.
- In irregular area of land, it can be difficult to operate.
- In rainy days in muddy environment, it can be difficult to operate.

10. APPLICATIONS

- It's major use in agriculture is to spray fertilizer.
- Pest control:
 - i. E.g., The machine can be used for controlling viral diseases by spraying the pesticides in sewage line.
 - ii. E.g., The machine can be used to spray insecticides on crops and fruits and thus prevents them from destroying
- Grass cutting: Field trimming for cricket ground, football ground, all playgrounds and plain surfaces as well as garden.
- In city and rural area, it can be used for spraying water on lawns.
- For the fungicides and bactericides application to control the plant diseases. And for the herbicide's application to kill the weeds.

11. RESULT

The machine reduces human efforts and time since it is operated by Android app available easily in any smart phone. The cost is reduced, since it has many features in a single machine. There is less human contact with hazardous chemicals which decreases the health issues and skin diseases. The solar energy is used as power source so the non-renewable energy sources won't be used. The two nozzle sprays more pesticide in both direction at a time. The 2-litre tank can spray pesticide for approximately one and half hour continuously. The battery is charged through solar panel which works for six hours. Since the machine is operated by the operator, the speed and movement of the machine can control via the Arduino Bluetooth RC.

12.CONCLUSION

By doing this project we conclude that, we can reduce the human efforts and this will be helpful for farmer. As it is operated on solar energy so the it is best application that does not affects on environment.

This project work has presented progress towards achieving a future precision autonomous farming system. This system is designed to help farmers in reducing their time and energy spent for pesticide spraying and weed cutting. This system will reduce labour problem in future. So, this system will be the best replacement for currently used systems like hand sprayers and tiller mounted sprayers.

The performance of the equipment will increase when it is operated on the smooth surface or less uneven surface and also it will be more effective when it is used on the crops having nearly similar height and having the less space between two crops.

13.ACKNOWLEDGEMENT

We desire to express our sincere gratitude to Prof. P.B. Pokhle (H.O.D), Prof J. Shelke and all staff of Electronics and telecommunication department, PJJLCE Nagpur. Without their active motivation, guidance and cooperation we would not have made advance in this paper.

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