

Solar Powered Electric Grass Cutter, Pesticides Sprayer and Lighting Unit

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Abstract: Agriculture is demographically the broadest economic sector and plays a significant role in the overall economy of India. For the growth of Indian economy, mechanization is necessary. The main purpose of mechanization in agriculture is to improve the overall productivity and production. The socio-economic conditions of peoples living in villages of developing countries including India, human muscle power can be good alternative to fulfil the energy requirements for performing many activities like water pumping and grass cutting.

Keywords: Solar Panel, Sprayer, Grass Cutter, Wheel Control.

1. 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.

2. Literature survey

A robot that operates on an on-board, solar charged battery has been designed by the French manufacturer N Eno. The Robo-Mower4 the capability of steering itself across a person's lawn. This robot called the Atawa A34, uses built-in infrared sensors to avoid obstacles. This system uses wires buried

beneath the surface of the ground to control it. It operates at a top speed of 21 ft/min. Robo-mower is a 12.5-pound solar powered robotic lawn mower that cruise the yard continuously and silently, using an on-board computer and sensor to guide the device while it cuts the grass. Poulan Weed-Eater and its parent company A.B. Electrolux of weden, plan full production next year. (St. Petersburg Times 3/12/94 A17) In 1994, Mansukh Bhai Jagani, developed an attachment for a motorbike to get a multipurpose tool bar. It addresses the twin problems of farmers in Saurashtra namely paucity of laborers and shortage of bullocks. This motor cycle driven plough (Bullet Santi) can be used to carry out various farming operations like furrow opening, sowing, inter-culturing and spraying operations. Mansukhbhai's intermediate-technology contraption proved efficient and cost-effective for small sized farms. It could plough one acre (0.4 ha) of land in less than half an hour on just two liters of diesel oil. Using motorbike-sanity, the cost of weeding a typical field was found to be just Rs 8/ha because as much as 10 ha land could be covered in a single day. But this spraying equipment needs fuel for its running and proper operation which increases its operating cost.

3. Literature S Necessity for an Automatic Grass Cutter, Sprayer & Lighting Unit

In order to spray the pesticides in farms, the people have to carry the pumps on their backs and pump it with their hands to pressurize it and they have bend down and cut the plants one after the other which puts a lot of strain and wears them out quickly. So, to reduce the human effort in rural areas we have developed a machine. The following challenges are overcome by this:

- There is a lack of mechanization in farming.
- Processes like spraying and grass cutting requires excess effort.
- More man power is required in agriculture field.
- More time consumption also leads to less productivity.
- To provide sufficient illumination in farm area.

4. Methodology

The methodology for this project is similar to the prototype

analysis process. In this project we are fabricating a prototype of the solar powered grass cutter, Pesticides Sprayer & Lighting unit.

A. Proposed system block diagram

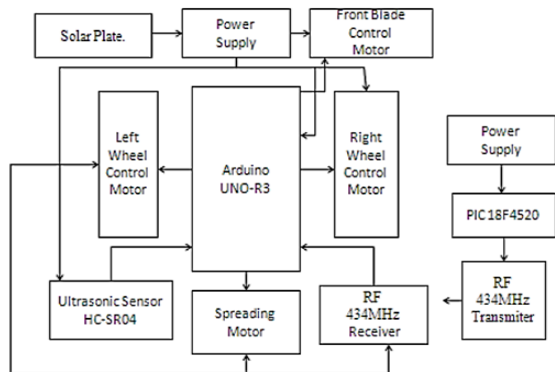


Fig. 1. Proposed system block diagram

With the help of a multi operational vehicle, the following objectives can be achieved:

- To minimize human effort in the agricultural field.
- To perform TWO operations (Spraying pesticides and grass cutting) at single time.
- To increases production and save time of farmers.
- No pollution problems.

Farmer can operate this vehicle easily without tiring for long times. In this project the main part is the Arduino UNO R3 which controls the all assembly of project. The user is with the RF control remote , the user has to select that in which mode the system has to operate either it is in manual mode and the auto mode in manual mode the user has to decide that where to move robot but in auto mode the robot will decide that where it wants to go . By using ultrasonic sensor, the robot will move. The blade of the robot is handmade design the motor used for the cutter is the brush less dc motor and it has the rpm of 35000 it operates on 12v dc supply.

The battery is source part for the project the battery is supplying the 12v dc for the motor and pump. The Charged on the solar plate once the battery is fully charged the robot will move properly. Also, the second application is the pesticide spreading here we use the 12v dc operated pump with the 1.5m length pipe and the spreading nozzle is connected at the one end of the pipe. For supplying water to the and storing pesticide we use the water tank of 2 liter. RF control remote used here has the range of 300ft(100m). In this range the use has to give instruction to the robot. The RF uses the frequency of 434MHz and we use the encoder and decoder ic at the transmitter and receiver respectively. The ic are HT12E and HT12D. Also, at transmitter the with encoder ic we use the another ic PIC181f4520 because the encoder ic is the 4-bit encoder but we require the greater than 4-bit control for that we use the PIC18f4520.

B. Solar panels



Fig. 2. Solar Panel

A solar panel works by allowing photons, or particles of light, to knock electrons free from atoms, generating a flow of electricity. Solar panels actually comprise many, smaller units called photovoltaic cells. (Photovoltaic simply means they convert sunlight into electricity.) Many cells linked together make up a solar panel. Each photovoltaic cell is basically a sandwich made up of two slices of semi-conducting material, usually silicon — the same stuff used in microelectronics.

To work, photovoltaic cells need to establish an electric field. Much like a magnetic field, which occurs due to opposite poles, an electric field occurs when opposite charges are separated. To get this field, manufacturers "dope" silicon with other materials, giving each slice of the sandwich a positive or negative electrical charge.

C. Arduino controller

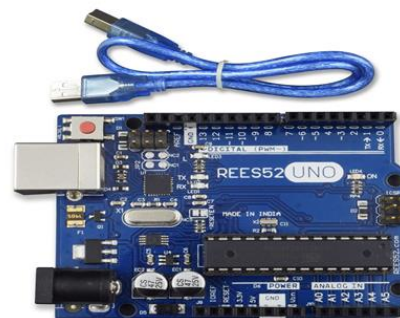


Fig. 3. Arduino Uno Controller

The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-

circuit system programming (ICSP) header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

D. DC motor



Fig. 4. DC Motor

An electric motor is an electrical machine which converts electrical energy into mechanical energy. The basic working principle of a DC motor: "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force". The direction of this force is given by Fleming's left-hand rule and its magnitude is given by $F = BIL$. Where, B = magnetic flux density, I = current and L = length of the conductor within the magnetic field.

Fleming's left hand rule: If we stretch the first finger, second finger and thumb of our left hand to be perpendicular to each other, and the direction of magnetic field is represented by the first finger, direction of the current is represented by the second finger, then the thumb represents direction of the force experienced by the current carrying conductor.

5. Conclusion

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 can be

operated on +12V rechargeable battery. This system will reduce labor problem in future. So, this system will be the best replacement for currently used systems like hand sprayers and tiller mounted sprayers.

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