



Solar Powered Grass Cutter & Pesticide Spraying Robot

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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 system control is done by the PIC18F45K22 Controller Automation is achieved by using sensors and PIC18F45K22 Controller. Wheels and cutting operations are done using dc motors. DC battery is utilized for powering and standby mode operation of the system. The whole supply is provided through the battery and to charge the battery charger circuit is used to provide the charging for the battery. Also, the second application is that the spreading of pesticide here we used the water pump with spreading nozzle.

Key Words: Solar Panel, Sprayer, Grass Cutter, Wheel Control, camera module

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.

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.

2. LITERATURE SURVEY

Solar powered remote control lawn mower lawn buddy. This design contains a microcontroller, multiple sensors, and a solar charging system. Adding these elements together, they get their robotic lawn mower. Remote control grass cutting machine by using photovoltaic source and motor speed control. It is an automated system for the purpose of grass cutting. The Source is drive from the solar energy by using photovoltaic panels from the photovoltaic panel and store the dc voltage in a battery. Autonomous Pesticide Spraying Robot for use in a Greenhouse.

This paper presents an engineering solution to the current human health hazards involved in spraying potentially toxic chemicals in the contained space of a hot and steamy glasshouse. ARM- Based Pesticide Spraying Robot. The main use of robots in agriculture is for harvesting, Fruit picking, driverless tractor or sprayer are design to supersede human labor. Main aim is to avoid manual spraying of pesticides at actual farm. It will achieve by replacing human by a robot, through transmission of video of crop to central station. Development and Automation of Robot with Spraying Mechanism for Agricultural Applications. This is achieved by the design and construction of an autonomous mobile robot for use in pest control and disease prevention applications in commercial Farm.

The effectiveness of this platform is shown by the ability to successfully navigate itself down rows of a Farm, spray the pesticides effectively while the farmer controls it from a far distance. And this pesticide spraying system efficiently covers the plants evenly with spray in the set dosages.

3. LITERATURE S NECESSITY FOR AN SOLAR POWERED 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 bent 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.

4.1 Proposed system block diagram

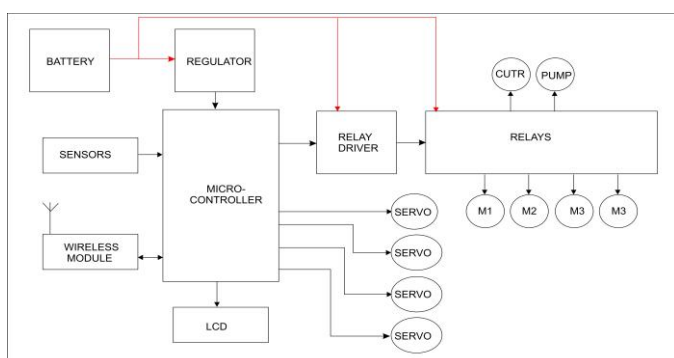


Fig -1: Proposed System Block Diagram

4.2 Working

4.3 In this project the main part is the PIC18F45K22 Controller which control 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 is HT12E and HT12D. Also, at transmitter the with encoder ic we use 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.

4.4 Solar Panels

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 semiconducting material, usually silicon — the same stuff used in microelectronics.



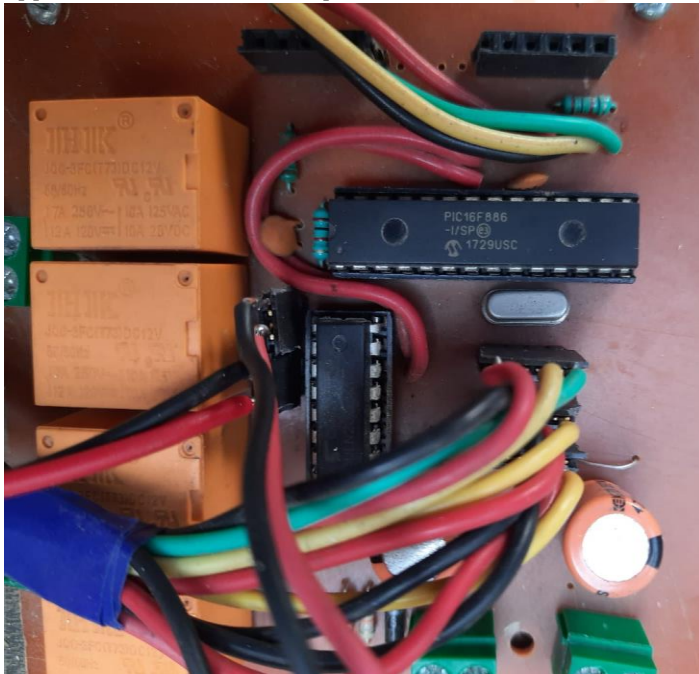
Fig -2: Solar Panel

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.

4.5 PIC18F45K22 Controller

The PIC18F45K22-I/P is a 1536-byte SRAM low-power High-performance Microcontroller with XLP technology. The PIC18F45K22 family introduces design enhancements that make this microcontroller a logical choice for many high performance and power sensitive applications. The PIC18F45K22 family incorporates a range of features that can significantly reduce power consumption during operation. The flash cells for both program memory and data EEPROM are rated to last for many thousands of erase/write cycles - up to 10K for program memory and 100K for EEPROM. Data retention without refresh is conservatively estimated to be greater than 40 years. This device can write to their own program memory spaces under internal software control. By using a bootloader routine located in the protected Boot Block at the top of program memory, it becomes possible to create an application that can update itself in the field.



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Applications

Computers & Computer Peripherals, Industrial, Automotive

4.6 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.



Fig -4: DC Motor

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.

4.7 Ultrasonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from

boundaries to produce distinct echo patterns.

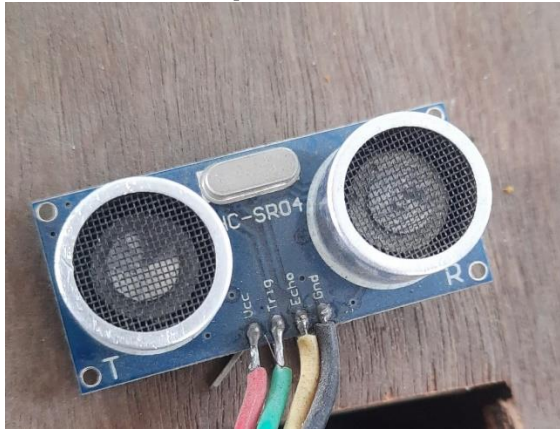


Fig -5: Ultrasonic Sensor

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

4.8 RF 434MHz Trance-receiver



Fig -6: RF 434MHz Trance-receiver

Features of RF module: - Operating Frequency -434MHz
 Operating Range-100m(300ft)
 Operating Voltage-5V

4.9 Water Pump



Fig -7: Water Pump

Operating voltage 12v
 Current-0.1A-0.5A
 Lift-130cm
 Flow Rte-300L/H

4.10 Circuit Diagram

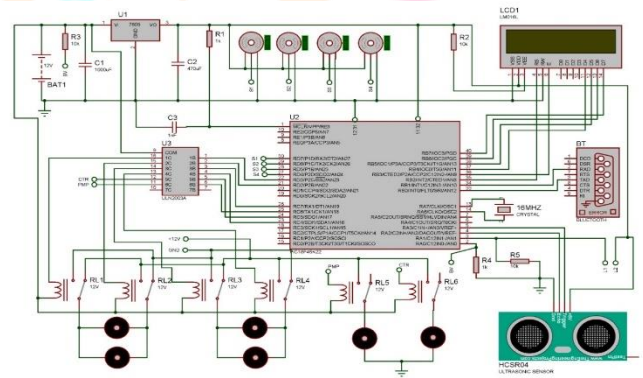


Fig -8: Circuit Diagram

4.11 ESP-32 CAM module

This module adopts a DIP package and can be directly inserted into the backplane to realize rapid production of products, providing customers with high-reliability connection mode, which is convenient for application in various IoT hardware terminals.

ESP integrates Wi-Fi, traditional Bluetooth, and BLE Beacon, with 2 high-performance 32-bit LX6 CPUs, 7-stage pipeline architecture. It has the main frequency adjustment range of 80MHz to 240MHz, on-chip sensor, Hall sensor, temperature sensor, etc.



can pull only 1.25. Based on the load which you use in the project you can select the motor with proper torque

5. CONCLUSIONS

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 effects 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 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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4.12 SERVOMOTOR

There are lots of servo motors available in the market and each one has its own specialty and applications. The following two paragraphs will help you identify the right type of servo motor for your project/system.

Most of the hobby Servo motors operates from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so make sure you project can live with the half circle if no, you can prefer for a 0° to 360° motor or modify the motor to make a full circle. The gears in the motors are easily subjected to wear and tear, so if your application requires stronger and long running motors you can go with metal gears or just stick with normal plastic gear.



Next comes the most important parameter, which is the torque at which the motor operates. Again, there are many choices here but the commonly available one is the 2.5kg/cm torque which comes with the Torpor SG90 Motor. This 2.5kg/cm torque means that the motor can pull a weight of 2.5kg when it is suspended at a distance of 1cm. So, if you suspend the load at 0.5cm then the motor can pull a load of 5kg similarly if you suspend the load at 2cm then