

Solar Powered Mobile Operated Smart Multifunction Agricultural Robot

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Abstract – The main aim of this project is to design a multitasking robot which can perform multiple operations in an agricultural sector at a time and the farmer can operate it by distant location via Mobile Bluetooth. This robot uses maximum solar energy with the help of solar power. Smart robot is implemented to perform different operations such ploughing, digging, cultivation, seed sowing, mud leveling and water spraying. The 61.5% of the Indian population depends on the agriculture field. This robot is design to raise the productivity, reduce labor cost, and make efficient and fastest work. The smart robot replaces the traditional techniques of farming with new efficient and accurate techniques. It saves human efforts and encourage farmer to use modern techniques of farming in a better way to get maximum profit from agricultural sector.

Keywords- Solar Power, Smart, Agricultural Robot, Mobile operated.

I- INTRODUCTION

The idea of applying robotics in agriculture is very new. In agriculture, the opportunity for robot has enhanced productivity and these robots are appearing in the farms in various guises and in increasing numbers. Solar powered mobile operated smart multifunction agricultural machine or device which helps in multiple functions of agriculture like seed sowing, digging, mud leveling, water spraying, cultivation, ploughing etc. This robot can dig the soil put the seed, leveler to cover the seed and sprayer to spray water, this whole system of robot works with the help of battery and solar power with tracing system.

Ploughing is one of the first steps in farming. During this process we till the land and make it ready for the seed sowing. By tilling we mean that a plough will be used which have teeth like structure at the end and will be able to turn the top layer of soil down and the bottom layer of soil up so that automatically ploughing will be done. After that, Seed sowing comes next where the seeds need to be put in ground at aregular interval and

these needs to be controlled automatically with limiting the amount of seeds. Mud leveler is fitted to close the seed underground. Water pump sprayer is used to spray the water on rows of plant orseed by using movable sprinkler mechanism.

Smart agriculture robot has a solar powered tracking system by using it solar energy is collected from all the directions. The robot having a Mobile Bluetooth module through which we can control robot from distant location also. The agriculture is the most important sector for the Indian economy. Using agriculture robot we can save energy as well as time of the farming process. So farmers can go for multiple crops in the farm within a proper span of session. It gives accuracy while seed sowing by row spacing arrangements in seed dropper mechanism using time delay. The robot drops the seeds by counting. So there will be no wastage of seeds. The movement of robot is flexible that means it can go forward and reverse also left and right and in any direction which is needed. There are two methods for solar energy tracking. First one is single axis tracking it has limitations because it does track sun in all directions.

Second one is dual axis tracking system in this solar plate rotate in all directions as sun moves. That's the key point of robot maximum power point tracking system. The following table shows the comparison between the traditional farming and modern farming techniques.

II-METHODOLOGY

WORKING

The figure shows various working areas of the robot. The robot having different part that plays an vital role in the design and the structure of solar powered mobile operated smart multifunction agriculture robot. Those are as follows

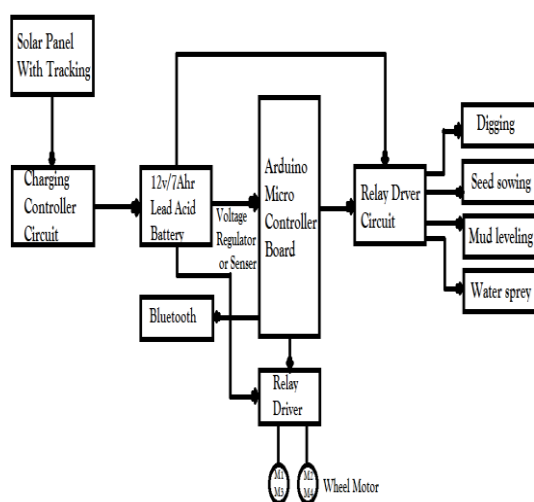


Fig. 1. Block diagram of smart agricultural mobile operated robot powered by solar system.

Following are the components which are used in this project

A] Solar panel

Solar panel is made up of series and parallel combination of solar cells. Solar cell is also called as photovoltaic cell because it converts light energy which is received from sun to electrical energy which can serve multiple functions here. Solar cell charges battery which in turn provides required potential to microcontroller and relay drivers. Solar panel's output is controlled and given to 12A/7Ahr lead acid battery here.

B] Chasis

Chasis is made up of plywood material and aluminum strips are used to make it compact in size. chasis on

which all the parts of projects are assembled. It is the base of project tools. Driving mechanism is fitted on chasis which is used to move the robot in particular direction which may be forward or reverse or at any angle.

C] Solar tracker

We have used dual axis solar tracker system. By the programming solar panel is compelled to track maximum solar radiations. It consists of stepper motors and four sensor light dependent resistor (LDR) which detect the light. The values from the LDR1 pin, LDR2 pin, LDR3 pin and LDR4 pin will be read and save LDR1, LDR2, LDR3 and LDR4. Then, the difference between the LDR1 and LDR2 will be taken to move the stepper motor 1 accordingly. The difference between the LDR3 and LDR4 will be taken to move the stepper motor 2 and 3 accordingly. Simple Solar Panel Tracker will automatically move towards the light like a sunflower. Here, the low power solar panel has been used to reduce the weight, if a high power or heavy solar panel is used, the stepper motor will be needed to choose.

D] Bluetooth device

HC05 module is pretty easy to use and Bluetooth Serial Port Protocol (SPP) module is fabricated for transparent wireless serial connection setup. The HC-05 Bluetooth module can be used to communicate between two microcontrollers like arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. To control the entire system, Bluetooth HC05 is connected to arduino and to android Smartphone wirelessly. Pairing the HC-05 module with microcontrollers is very easy because it works using the SPP.

E] Microcontroller

The five devices in the family are available with 3.5, 7 or 14 Kbytes of self-write Flash memory, up to 256 bytes of data EEPROM, and up to 368 bytes of RAM. All Over time, even the simplest embedded applications gain complexity as new reliability and feature requirements emerge. Due to cost and board space constraints, these systems are typically implemented with a single small Flash microcontroller. Microchip Technology offers a full range of products designed for systems whose control code fits within a small footprint, but require more extensive communication or actuation capability than 8-bit microcontrollers traditionally offer.

WORKING MODEL:

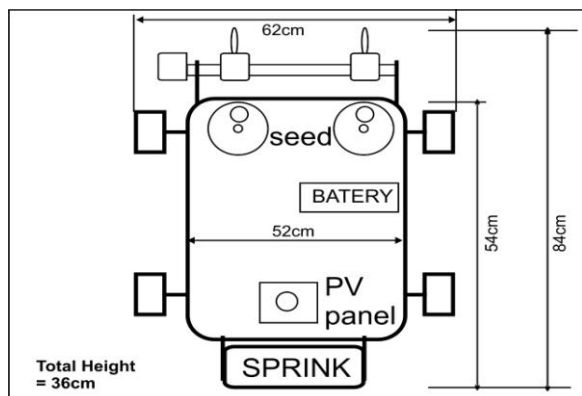


Fig. 2: Working diagram of solar powered mobile operated smart multifunction agriculture robot.

The aim of our project is design and develops a multipurpose robot, which is used to reduce time and human effort. The operations are carried by a robot are harvesting, digging, seed sowing and leveling to close the soil and also sprayer to spray a fertilizer. These all operations are performed by using the battery and solar power.

The frame of robot is made of plywood and alluminium. The four wheels are connected to the frame, which are driven by using a DC motor.

–The front of frame harvester rotor is connected and this rotor is rotate by using DC motor. – On the middle of frame three diggers are connected to dig the soil. The nut and bolt arrangement is used in the robot, by using nut and bolt up and down position of digger is done.

– Pipe is used to store the seeds. Three hoses are used to connect funnel and digger, into the hoses seeds are flow down with the help of low speed motor.

– At the end of frame the leveler is connected by using leveler the seeds are close in the soil

– Sprayer is used to spray the fertilizer on the crops. Pump is used to spray the fertilizer and the pump is operated on the DC motor.

– Top of the frame solar panel is mounted. Solar panel is connected to the battery. To operate all system it requires 12V battery.

A. Digging Operation: - There are three digger are used in digging operation. The diggers are mounted on the middle of the frame. Digger mechanism is used to digging and seed sowing. All the diggers are adjustable which are connected to the frame by nut

and bolt arrangement. Holes are produced on the diggers. The funnel and diggers holes are connected by using the hoses.

- B. Seed sowing Operation: - Seed saving is the process of planting seed. Tradition method of seed sawing based on assumption of seed to seed sparing & depth of placement which is not efficient & it required lot of time and effort. Some time it may cause backache problem to the farmer.
- C. Mud Leveling Operation: - A sheet metal plate is used as soil closer & leveler. The material of sheet metal plate is mild steel. An arrangement of nut & bolt is used for sheet metal plate up & down movement. The leveler is fixed to the frame which closes the soil in the sowed soil & level the land.
- D. Water spraying operation: - A water container is used for water storage. A water pump is used for pumping water to the water sprayer. The water flows to the sprayer through pipe. The power for pump is regulated by a toggle switch.

Weeding Operation: - Weeds are plants which are unwanted. They can cause damage to the crop due to improper ventilation. And there is more chance of fungal attack. A small rotor on which the curve shape blades are mounted to remove the weeds from soil. This rotor is operated by using a DC motor. Weeding refers to the removal of weeds.

III- CONCLUSION

This paper presented the concept of automatic multifunctional agricultural smart robot which is designed to perform multiple functions like digging, mud leveling, water spraying, Pesticide spraying, ploughing etc. All the functions performed by robot is automatic hence it lessen the human errors and makes the plant cultivation process easier and efficient. Due to minimum errors it can utilize resources without any wastage. This robot uses solar energy i.e. non conventional source of energy which is renewable. This robot is mobile operated via Bluetooth which ensure human safety as operator will not directly comes in contact with this system. Robot is controlled by android app which is programmed and by giving particular instructions we can use robot to perform that particular operation. This smart robot will save farmer's time and also reduces labor cost final model of project is shown below.



Figure 3. Smart agricultural mobile operated robot powered by solar energy

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