

Design and Fabrication of Seed Sowing along with Automatic Irrigation System Using Robotic Vehicle & Solar Panel

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Abstract - The purpose of the project is to build a multipurpose agricultural robot which can perform various operations like seed sowing and irrigation. One of the important profession in India is farming so it's essential to seem out for automation in field work to scale back man power. This project focuses on farming work like automatic irrigation system, and seed sowing. The system comprises of a mobile robot and a dryness sensing module. The system is fully adaptive to any environment and takes under consideration the watering needs within the irrigation. This hardware describes the fully automated watering system. It uses wireless communication to communicate between the mobile robot and the sensing module. It is equipped with microcontroller, an on board water reservoir and an attached water pump. This robot uses solar energy as a source of power and this energy is stored in battery. By using solar energy we can minimize the extra expenses of farmers in terms of electricity bill. It is best option as an alternative of electrical energy and also not affect the environment as it is a clean energy. This project is overall cost saving and environment friendly.

Keywords: Non-Conventional Energy, Agricultural Practices like irrigation and seed sowing

1. INTRODUCTION

1.1 Problem Statement

As we all know that India is an agriculture dominated country. In India 50% of our population depends on agriculture. If India's GDP has to be reach at 9-10% for the next 30 years, then it is impossible without bringing revolution in the agriculture sector, because 50% population means near about 70 crores people which is more than double the population of United States.

At present many countries have shortage of skilled labour in agriculture sector, some of the major

problems in the Indian agriculture are rising of input costs, availability of skilled labour, lack of water resources and crop monitoring which affects the growth rate of the developing countries including India which hugely depends on agriculture sector. As the population of India is rising, demand of food is additionally escalating which results in higher crop production per hectare. To overcome these problems, the technologies including automation were used in agriculture. The automation in the agriculture could help farmers to reduce their efforts so, to fix these problems farmers should use latest technological advancements for the various agricultural practices like digging, sowing, irrigation etc., which are more efficient and fewer time consuming. So to overcome the scarcity of crops farmers need some technological advancements in various farming operations like seed sowing, irrigation, ploughing etc., which should be more efficient and consume less time also. The automation in the agricultural sector could help farmers to reduce their efforts.

The special vehicle plays a major role in various fields such as industrial, medical, military applications etc. The special vehicle field are gradually increasing the productivity of this vehicle in agriculture field.

We propose a machine which can carry out various farming activities like seed sowing, irrigation etc. Our proposed robot saves time and labour requirement, thus saving tons of cash alongside the reassurance of proper seed broadcasting.

This project helps farmers by saving money, time, energy and labour. As this project completely uses solar power there won't be any pollution caused to be worried. With the advancements in the system they can also make it a completely autonomous where no

human is needed to control it. Everyone knows agriculture is the backbone of Indian economy where nearly 70% of the population depends on it. If everyone can make use of most of the technology, there will be a substantial growth in this sector.

This will minimize the waste of water also in an Agricultural farm. The smart system developed by using automated drip irrigation and uses the exact water required depending on the soil moisture.

1.2 OBJECTIVE

- a. The main objective of this project is design and manufacturing a robot that is capable of sowing seeds and water irrigation in uniform order.
- b. Individual can easily operate this robot with a minimum knowledge without any problem.
- c. Reducing cost as well as human effort using various agriculture operations likes seed sowing and irrigation.
- d. Save electricity by using solar panel, which produce pure clean energy.
- e. Testing of development of solar powered seed sowing with automatic irrigation system in actual agriculture farm.

2. LITERATURE REVIEW

Laukik P. Raut et al. [1] studied to meet the food requirements of the growing population and rapid industrialization, modernization of agriculture is inescapable. Mechanization enables the preservation of inputs to ensure better delivery, reducing the volume required for better response and preventing loss or wastage of applied inputs. Mechanization reduces unit costs of production through higher productivity and input protection. Farmers have been using the same methods and tools for ages. In our country farming is done in the traditional way, apart from this there is a greater development of industrial and service sector than agriculture. Spraying is traditionally done by backpack sprayer labour which requires more human effort. Weeding is usually done with the help of bulls which becomes costly for small land cultivated by farmers. So to overcome these two problems a machine is developed which will be

beneficial for the farmer for spraying and weeding works.

M. Lincy Luciana et al. [2] focused on the designed system basically has two inputs (i) moisture sensor and (ii) level sensor and two outputs (i) pumping motor and (ii) solenoid valve. The combined working of level sensor and moisture sensor for the efficient use of irrigation makes this project unique. The level sensor determines our pumping motor to run or not for fetching water from the bottom to a reservoir.

Ibukun B. Ikechukwu et al. [3] focuses on the design and construction of a manually operated single row maize planter and is capable of sowing seeds in a straight line with uniform depth in fur, and with equal spacing between seeds. The work specifically demonstrates the appliance of engineering techniques to scale back human labour within the garden. Results obtained from test trials showed that the planter worked properly with a planting capacity of 0.0486 ha / hr. Visual inspection of the seeds released from the planetary metering system showed no obvious signs of damage to the seeds.

Kyada A. R et al. [4] discussed basic requirements for small scale cropping machines. They should be suitable for small farms, simple in design and technology and versatile for use in various agricultural operations. A manually operated template row planer was designed and developed to improve planting efficiency and reduce the drag involved in the manual planting method. Seed planting is also possible for different types of seeds with variable depth and space between two seeds. In addition it increased the accuracy of seed planting, seed / fertilizer placement and was made of durable and inexpensive materials for small scale farmer farmers. The operation, adjustment and maintenance of principles were simplified for effective operation by unskilled operators

Chaitali R. Fule et al. [5] explain about the moisture of agricultural soils by real-time method and to minimize this manual involvement by the farmer. Which is why we are using a microcontroller (AVR ATMEGA-16) RF module. The sensor senses the amount of moisture.

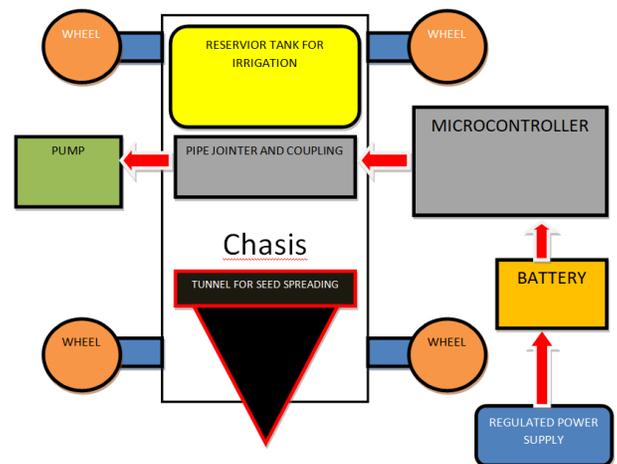
Swetha S. et al. [6] discussed machine solar panel is used to capture solar energy and then it is converted into electrical energy which in turn is used to charge 12V battery, which then gives the specified power to a shunt wound DC motor. This power is then transmitted to the DC motor to operate the wheels. And to further reduction of labour dependency, IR sensors are wont get robot within the field. Here 4 post sensors are wont to define the territory and robot senses the track length and pitch for movement from line to line.

Trupti A.Shinde. et al. [7] Focused on seed sowing machine system, they're used battery powered wheels and dc motor inbuilt in these wheels. When the seeds are empty it senses the extent of storage seed and indicates the alarm. When any obstacle comes within the in-front of machine or divert path the seed sowing machine can detect this obstacle very easily. In each complete rotation of rotating wheel there's seeds falls from this seed drum and therefore the seed plantation process can happen smoothly also as without wastage of seeds. The end of system machine reached and it created alarm.

3. METHODOLOGY

- 4.1 In this proposing system we will going to make the robot or chasis that will help full for dropping the seeds during the cropping time.
- 4.2 For the cropping setup we will make the small conveyor setup that is responsible for dropping the seed in cropping section.
- 4.3 In this the whole setup will be control through the people mobile phone by using the Bluetooth setup.
- 4.4 In we will also going to implement the automatic irrigation setup that will send the data to the microcontroller that microcontroller start or stop the pump for necessary process.
- 4.5 Over the chasis we will placing the tank in that we will store the water in it for reserve time whenever the dryness will occur it will automatically switched on the pump setup.
- 4.6 The sensor will deep inside the soil as per require range by using the rack and pinion setup.

4. BLOCK DIAGRAM



5. COMPONENTS/ HARDWARES

- 6.1 Microcontroller
- 6.2 Motor
- 6.3 Wheel
- 6.4 Tank
- 6.5 Chassis
- 6.6 Pipe
- 6.7 Screw
- 6.8 Nut bolt
- 6.9 Solar Panel
- 6.10 Battery
- 6.11 Bluetooth Module

6. SELECTION OF VARIOUS PARTS USED IN THIS PROJECT

6.1 Microcontroller-

A microcontroller is a small computer (which is used to operate all devices like DC motor, Bluetooth module etc.) on a single integrated circuit.

6.2 Arduino-

It depends on 8-piece ATmega328P microcontroller with different parts, for example, precious stone oscillator, sequential correspondence, voltage controller and so on to help the microcontroller.

6.3 DC Motor-

The motors used for this robot are of following specifications-

Voltage- 9V to 12V

Current- 0.25 mA

Speed- 100 rpm

6.4 Bluetooth Module-

The Bluetooth module being utilized in the task is HC-05 having voltage between 3.3V to 5V. Its open space connectivity lies between 25 meters to 50 meters.

6.5 DC Pump-

We'll use reciprocating pump for irrigation purpose which will be connected to sensor. There are some specifications of the pump as following-

Voltage- 9V to 12V

Current- 0.25 mA to .5mAmp

6.6 Solar Panel-

The solar panel which we are using is of following specifications-

Voltage- 6V to 12V

Current- 1000mAmp or 1Amp

6.7 Battery-

The battery we are using in our project is of following specification-

Voltage- 8V

Current- 1 Amp

Rechargeable battery

7. DESIGN AND CALCULATIONS

7.1 For seed sowing-

a. DC Motor-

Given specifications-

We have used 9 to 12 volt, .25mAmp and 100 rpm DC motor to operate the vehicle. The motors are 2 in number.

So the power need to operate 2 motors will be

$P = \text{Voltage} * \text{Current} = V * I = 12 * .25 = 3 * 10^{-3} \text{ Watt}$ or .003 Watt

Torque required to operate the vehicle is given by

$T = (60 * P) / (2 * \pi * N) = .0286 \text{ N-mm}$

From above calculation we can say that 0.0286 N-mm torque will be required to each of the wheel.

b. DC pump-

Given specifications-

We have used 12 volt and .5mAmp DC pump in our vehicle.

Total power need to run 1 DC Pump will be,

$P = 12 * .5 = .006 \text{ Watt}$

And the setup of Arduino, Microcontroller and Bluetooth Module will consume .001 watt

So the total power consumed by our vehicle will be,

$P = .003 + .006 + .001 = .01 \text{ Watt}$

7.2 For Irrigation-

For irrigation purpose we have not calculated anything because in our project our main aim is the water irrigation with automation. We will only use a small pipe which will be connected to a DC pump by which we will get water supply.

After the successful testing of our project we will try to add some features to do irrigation in an efficient manner.

8. CONCLUSIONS

An automated irrigation system is successfully designed and assembled. It serves to scale back the consumption of water used, the human monitoring and therefore the labor related to standard methods. This system is often manufactured at relatively low cost using simple electronic parts. The irrigation system is very important nowadays because we need to use water effectively and efficient to avoid the

waste of water. Besides, it'd helpful the agriculture field to regulate the consumption of water and it's going to be increase the assembly of fruits or vegetables. However, the design is still in prototype stage. More tests got to be conducted before the efficiency, durability and reliability are often demonstrated. Additionally, many improvements can be made to make the system is more versatile, customizable and user-friendly.

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