Design and Fabrication of Solar Powered Automated Seed Sowing Robot

Patel C H, V V Satya Bhargav, Sasank Kumar Reddy, B. Abishek, D. Farooq Basha
Mechanical Engineering Department, Lovely Professional University
Jalandhar, Punjab, India.

Abstract- There are a lot of advancements in every branch of science and agricultural advancements are no exceptional. Every day agricultural sector is also advancing with the help of technology. But, due to the costs of the technologies being developed are very high, majority of the people are not able to make use of this technology. Solar powered seed sowing robot is a machine which semi-automatically sows seeds thereby saving time, costs of labor and loss of seeds. The seeds are sowed at a particular rate with uniform distances/pitch. As the robot is solar powered the robot doesn’t need to stop in between the sowing to recharge. The robot is a Bluetooth operated semi-automatic controlled by the user. The main objective of this robot is to create it at a low cost so that it can be afforded by everyone and can make use of the technology with simple electronic components and mechanisms.

I. INTRODUCTION

This project is about the designing and manufacturing of a seed sowing robot which can be easily operated by any individual. The project mainly focuses on applying robotics in agriculture to reduce human labor, time and increase productivity by sowing seeds within particular distances. This project helps farmers by saving money, time, energy and labor. 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 know agriculture is the backbone of Indian economy where nearly 48% 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.

Ranches need to utilize redesigned innovation for development movement (burrowing, seed planting, preparing, showering, and so forth.). So it’s a great opportunity to build up the rural hardware to defeat this issue. Horticulture has been the quality of the Indian economy and it will keep on remaining so for quite a while. Seed planting machine is a gadget that supports the planting of seeds in a needed area consequently bolster the ranchers in setting aside time and cash. The clear goal of planting activity is to place the seed and compost in columns at needed seed to seed space, cover the seeds with soil and convey appropriate compaction over the seed. As the number of inhabitants in India keeps on raising, the final offer for produce.

II. PROBLEM STATEMENT

Ranches need to utilize redesigned innovation for development movement (burrowing, seed planting, preparing, showering, and so forth.). So it’s a great opportunity to build up the rural hardware to defeat this issue. Horticulture has been the quality of the Indian economy and it will keep on remaining so for quite a while. Seed planting machine is a gadget that supports the planting of seeds in a needed area consequently bolster the ranchers in setting aside time and cash. The clear goal of planting activity is to place the seed and compost in columns at needed seed to seed space, cover the seeds with soil and convey appropriate compaction over the seed. As the number of inhabitants in India keeps on raising, the final offer for produce.
sowing like digging before dropping seeds and covering with sand, watering by using non-conventional energy resources.

In many rural areas of our country where the availability to get fuel like petrol, diesel and kerosene are almost impossible to get cannot afford to rely on fuel based machinery, so the renewable sources like solar are much reliable and in countries like India where there is abundant of sunlight it is better to use more of solar energy without pollution unlike fossil fuels.

The methodology of their work is to convert the sun’s solar energy to electrical energy which in turn converts the energy to mechanical energy by using DC motors and chain drives. They have used 12V battery which is quite enough power to operate the whole machinery. DC motors are installed to transmit the power by using chain drives. The team intelligently came up with the idea of sharing mechanical energy and electrical energy for more efficiency. Their project’s main objective is to make a seed sowing machine which is mainly used for seed spacing, covering seed with enough soil, proper spacing, proper depth from one seed to another seed.

This type of seed sowing machine or robots are better with cereals like ground nuts, all types of dals, oil seeds etc. At first the batteries are charged by solar panel. The batteries are of electrochemical cells which turns their chemical energy to electrical energy when they are charged. These batteries are used to power different electrical components like DC motors, seed hoppers, etc.

V. COMPONENTS

a) 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.

Fig. 1: Arduino UNO

b) BLUETOOTH MODULE

The Bluetooth module being utilized in the task is HC-05 Bluetooth to sequential port module.

Hardware features
- Typical -80dBm sensitivity
- Up to +4dBm RF transmit power
- Low Power 1.8V Operation ,1.8 to 3.6V I/O ☐ PIO control
- UART interface with programmable baud rate
- integrated antenna with edge connector

Fig. 2: HC-05 Bluetooth Module

c) Motor

Fig. 3: 12V DC motor

The motors used for this robot are 12V DC Motors with 100 RPM.

d) Solar panel

Fig. 4: Solar panel

The solar panel being used is WAAREE WS-3A with
- Max of 3.0W
- Max voltage of 8.80V
- Max open circuit 0.34A
- Short circuit current 0.38A
- Open circuit voltage 10.0V
- Max system Voltage 600V

e) Lead acid batteries

It comprises electrochemical cells which convert put away compound vitality into electrical vitality. Every cell contains a positive terminal and a negative terminal. Electrolyte is liable for particles preparation among anodes and terminals. These particles preparation enable current to stream out of the battery to perform work.

Voltage- 12v

VI. DESIGN AND CALCULATIONS

Specifications Voltage=12 volts, Speed n=100 rpm Power P=?
Torque T=\
To calculate the initial power P=3*v
P=3*12 (v=12)
P = 36 watt
To calculate the Torque P=2*π*n*T/60 36=2*π*100*T/60 (n=100, P=36)
T=60*36/2*π*100
T=3.43*10^3 N-mm

Solar panel

Maximum Power [P_{max}]= 3.0 W
Maximum Power Voltage [V_{mp}]=8.80V
Maximum Power Current [I_{mp}]= 0.34A
Open Circuit Voltage [V_{oc}]= 10.0V
Max system Voltage= 600V
The average sunshine hours fall on solar panel
Avg. Hours =Daily Sunshine hour in Summer+ winter +monsoon/3
⇒ 6+4.5+4/3
The robot is capable of performing the operations like operated. The robot is not autonomous, but it is automated robot is able to sow the seeds in row and is manually completed is working properly. The desired seed sowing microcontroller the data and sends to the Arduino which contains the coding. Arduino process smartphone then the command When any one of the seven commands are provided through those commands provided in the table it in a simplified manner all Authors need to do is remember robot. commands can be given to the robot. connect to HC activates which can be connected to any Bluetooth module. Both GND input and output are connected to GND of microcontroller are connected to VCC of Bluetooth module. VSS (Voltage Source Supply), EN1 and EN2 of the and GND to power source.

The circuit schematics from the explains the connections to all the components. The digital TXD or TD (Transmit Data), RXD or RD (Receive data) and GND (Ground references) are connected to RX (Receiving pins), TX (Transmitting pins) and GND of Bluetooth serial to port module respectively, the analog +5V is connected to VCC (Voltage Common Collector) of Bluetooth module. Analog \( V_m \) (Voltage input to Arduino) and GND to power source.

VSS (Voltage Source Supply), EN1 and EN2 of the microcontroller are connected to VCC of Bluetooth module. Both GND input and output are connected to GND of module.

The digital D9, D10, D11, D12 are connected to IN4, IN3, IN2 and IN1 of microcontroller respectively

When the power is supplied to the system Bluetooth module activates which can be connected to any Bluetooth smartphone. Open Bluetooth and pair it with HC-05. In the smartphone go to any Arduino Bluetooth application and connect to HC-05. Using smartphone application commands can be given to the robot.

After connecting to the smartphone, you can start using the robot. As one of the main objectives of the project is to use it in a simplified manner all Authors need to do is remember those commands provided in the table 6.2.1.1.

When any one of the seven commands are provided through smartphone then the command is sent to the Bluetooth module. The Bluetooth module sends the received command to the Arduino which contains the coding. Arduino process the data and sends the signal to the microcontroller. The microcontroller which received the data from the Arduino executes the command.

VII. CIRCUTRY AND WORKING

The seed hopper has a rate of 10 RPM. The solar panel has an output of 10V to recharge the battery.

8 hours

This is the isometric view of the 3D model. The supported beams used for solar panel are made of wood. The base of the body is combined with wood and cardboard. The storage tank and the supporting beam is made up of complete cardboard. Overall height of the robot is 12” inches. Overall width of the robot is 29 cm or approximately 12” inches.

VIII. RESULTS AND DISCUSSION

a) RESULTS

The solar powered seed sowing robot that Authors have completed is working properly. The desired seed sowing robot is able to sow the seeds in row and is manually operated. The robot is not autonomous, but it is automated with manual control. It carries the seeds and move along the operated path and drops the seeds with uniform distances. The robot is capable of performing the operations like moving forward, backward, turn and dropping seeds. The chassis is rigid, and all the motors are fitted properly and are ensured to perform the tasks effectively.

The seed hopper has a rate of 10V to recharge the battery.

b) DISCUSSIONS

After taking several advantages and disadvantages in consideration Authors have discussed how it can be more useful to for farmers than just being a toy.

1. The robot can maintain spacing between two seeds which is very much helpful for the germination and the growth of seeds.

2. Even though the seeds are dropped one after the another unlike human beings it won’t get tired so it keeps on doing the job without the loss of seeds.

3. The robot can literally save all the costs human labor performing by different individuals by a single robot-like watering, weed removal etc. it saves lot of time, human labor for the farmers.

4. Can achieve automation in agricultural field in the very near future which saves a lot of burden on farmers.

IX. CONCLUSION

As the name, itself suggests that Authors are using solar powered Automatic seed sowing Robot, it can perform tasks like sowing seeds by automated manual control. The robot is operated by enabling Bluetooth from our smartphone. As Authors have a numerous models of seed sowing machines not all of them are completely solar powered which conserves costs. With the help of these type of machines Authors can advance the farming techniques. Authors are saying that there are advancements in farming sector everyday however still many of the rural people practices the old techniques which takes so much of time, labor, and comes at a greater price.

With the help of the latest technology and advancements in all the sectors Authors should create awareness in the rural people by creating the technological advancements which are very much available and more convenient ways to increase the production and faster ways of yields. Every sector is showing a major growth every year except agricultural sector which our lives are depending.

The seed planting machine has been structured and manufactured and the procedure of seed planting is mechanized utilizing IoT so as to limit the human exertion. The power goes through the Arduino and machine comes online to get order from the controller which is android Smartphone. With the commands the machine works according to the given.

REFERENCES


