Multipurpose Agricultural Solar Robot

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Abstract: The aim of this paper is to represent the design and fabrication of multipurpose agricultural solar robot. This robot can perform several operations like seed sowing, fertilization and water spraying, it is equipped with solar panel and Arduino. Speed of the motors are controlled by relays. We know that in our country agricultural plays a major role in economic development, our farmers still uses the conventional old machines for farming operations unlike foreign countries , but this machine opens gateway to new technology. Robotics is emerging field in this century so here we make use of robotic technology in agricultural field in order to make this multipurpose agricultural solar robot, which is more advanced and efficient than conventional system. From the economic perspective this machine has an edge over conventional machines. Arduino based system controls all the operations by just pressing of buttons so it makes it less complex and user friendly. The estimated cost of this robot is 25000 INR, with the use of this machine the farmer can saves his more time, money as well his operations are more efficient than old machines.
Keywords: Seed sowing, fertilization, Arduino, relay, robotics

I. INTRODUCTION

India is country where about 40% of its population depends on agriculture, so agriculture plays a major role in Indian economy. India is a home to 1.3 billion people it makes India 2nd most populous country in the world after China. So food demand is very high in India, it stresses the current agricultural system. In India the farming is still carried out using manual or semi-automatic machines ,as we know that 21th century is era of science, technology and modern solutions.so the usage of technology in agricultural field is increasing rapidly but it also increases the cost of production with it. So we find that that we should apply some modern solutions in this field at a cheaper rate. Another perspective is that in conventional agricultural practises involvement of human labour is very high, so this multipurpose agricultural machine is a step towards automatic agricultural process. Also the resources like water and land are decreasing rapidly so this becomes a major challenge in front of our human civilization to use rescources very effectively and at very low rate, this machine is equipped with several technology which saves various resources like water, electricity and also emits less pollution. Arduino makes all the process autonomous and very accurate so the effectiveness and more productivity can be achieved. This machine is also equipped with various sensors like humidity, weed detector etc.

II. DESIGNING AND FABRICATION

A. Fundamental idea of Design

In this paper our focus is to fabricate a multipurpose agricultural robot which can perform agricultural tasks like seed sowing, fertilizer and water spraying very effectively, so that the farmers can save more resources as compare to conventional agricultural machines. We also have a thought that the complexity of this machine can be reduced, so normal farmer can use it very comfortably and very efficiently.
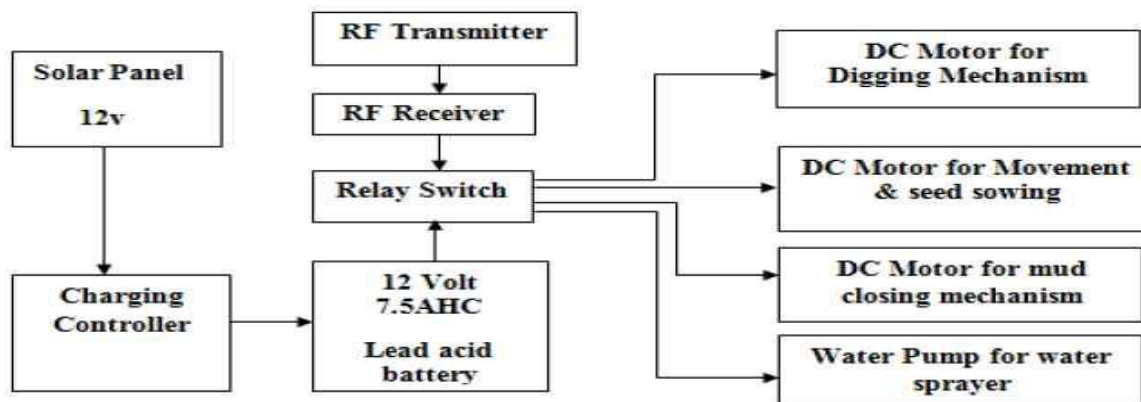

Fig-1 Block diagram of multipurpose agriculture solar robot

B. Steps Involve In Fabrication

1) The selection of frames is solely decide the price of whole machine, in order to select the appropriate frame one should pay attention to the frame characterstic like thermal stability, fatigue load bearing, rusting and load bearing capacity,
So after all research we found that cast iron will be the most appropriate material for our chassis.

2) At the front of the chassis the cutter is attached which cuts the unwanted plants like weeds and grass, the cutter is operated by dc motor.

3) At the middle of it digger is coonected which dig the soil simultaneously the seeds are sowed into the soil, seeds are filled into a container which is mounted on the top.

4) After this humidity sensor along with water sprayer is attached to our machine.

5) Solar panel is mounted on the top of this robot, its area is also determined using calculation.

6) 12 V battery is used for this agricultural robot.

7) Arduino and relays are used for autonomous functioning.

C. Components Used

1) Cast iron for chassis

2) Dc motors for cutters and digger

3) Solar panel

4) 12 v battery

5) Arduino board powered with atmega328 chip for autonomous functioning

6) Water sprayer

7) Sensors

8) Container for seed storage

9) Relay for controlling speed of motors

10) 12 V battery
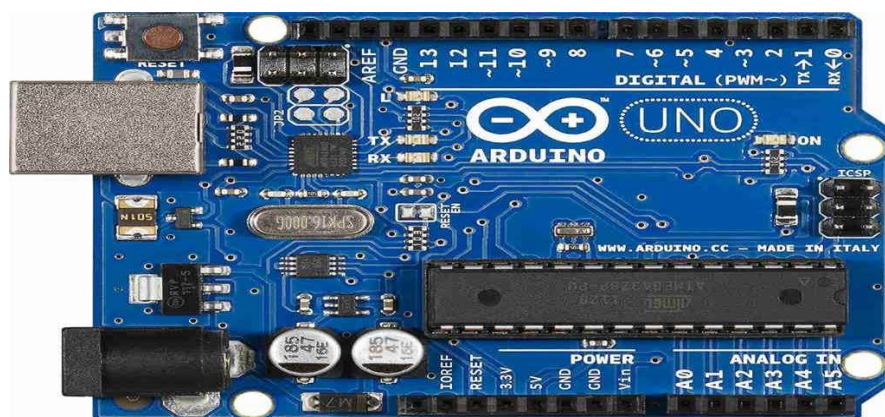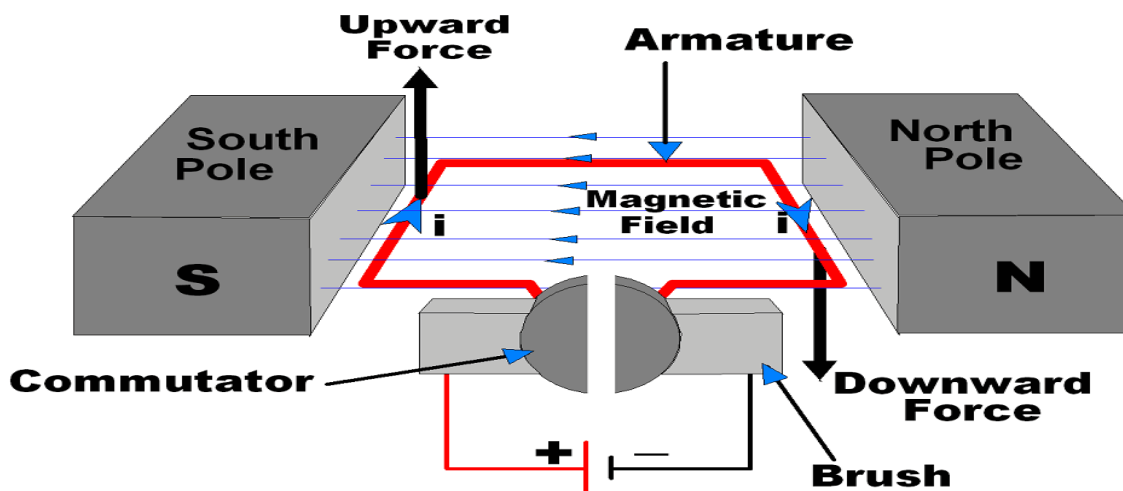
11) LEDS

12) Digital circuit

Fig 2- Arduino Board

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage	7-12V
Digital I/O Pins	14 (of which 6 provide PWM output)
DC Current per I/O Pin	40 Ma
Flash Memory	32 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

FIG 3- Characteristics of Arduino

D. DC Motors

DC Motor Conceptual Diagram

E. Motors Property

Parameter	value
Torque of motor	.26 Nm
Speed of motor	210 rpm

Solar panel is a device which convert light energy into electric energy by the process known as photovoltaic effect. These layers are sandwiched between silicon. When sun rays hit the panel the proton of threshold frequency exited the electrons which creates an electric field this effect is known as photovoltaic effect. When silicon doped with phosphorus N type semiconductor produced and when doped with boron P type semiconductor produced.
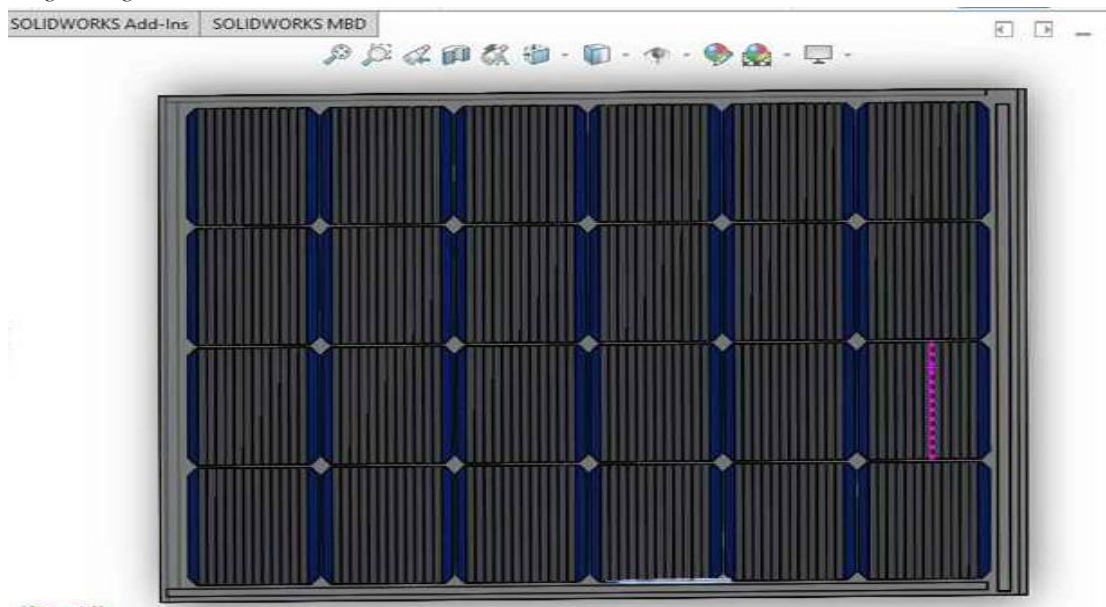
F. Solar panel Design using Solidworks
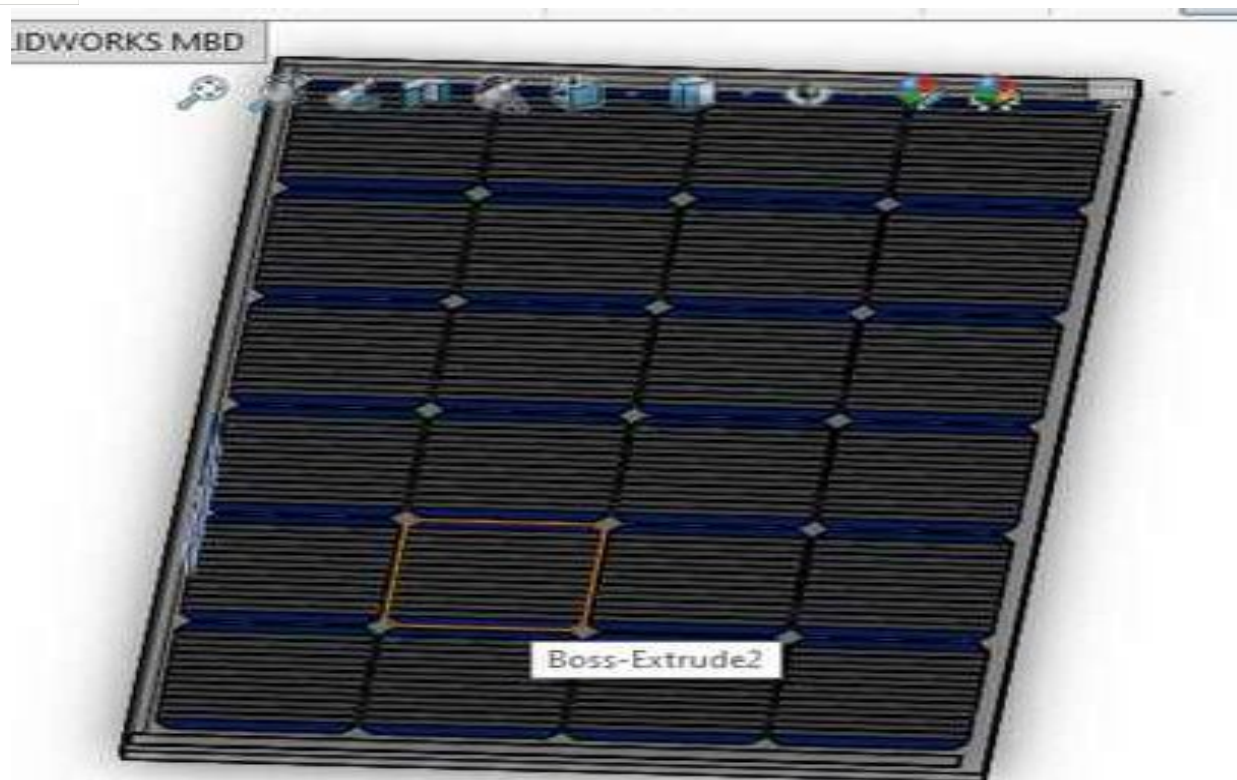

FIG 4- Solidworks model of solar panel

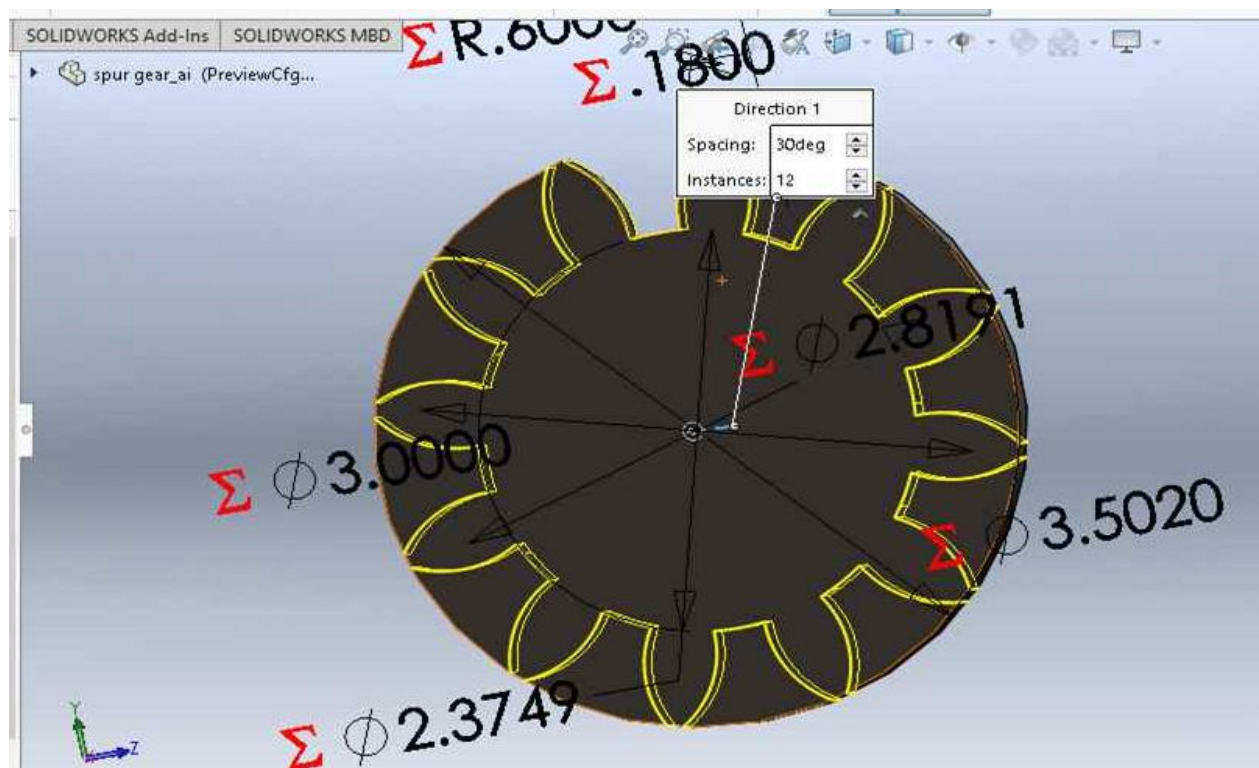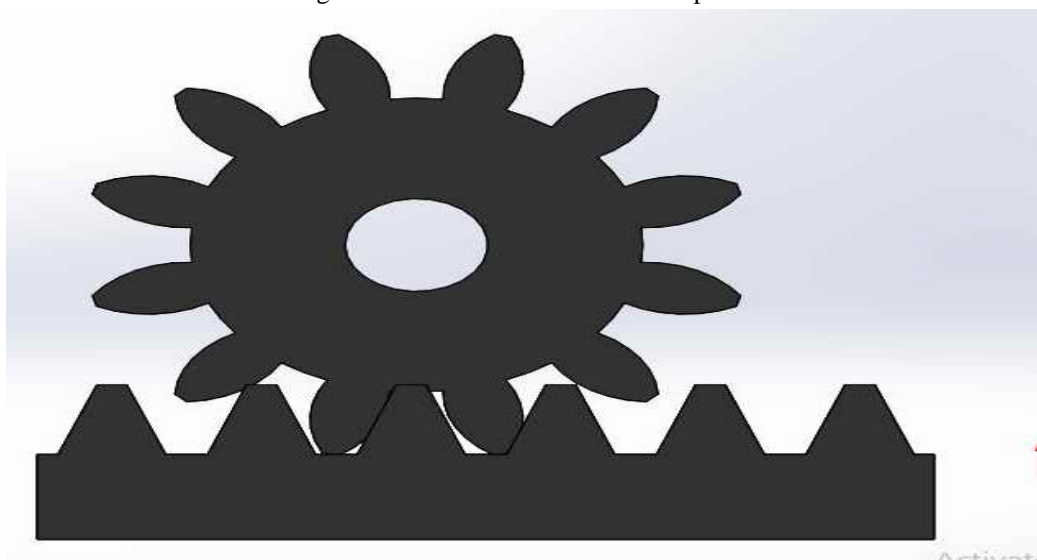FIG 5- solidworks model of solar panel

G. Rack and Pinion Arrangement

Fig 6- Solidworks model of gear

Fig 5 –solidworks model of rack and pinion

H. Chassis

Fig 7- solidworks model of chassis

I. Wokring
1) As soon we turn on the power, motors starts the cutter which is in front, it remove all the grass
2) All the operations are controlled by Ardiuno which is embedded with atmega328p chip.
3) Now the moisture sensor sense the soil if moisture is less, water is sprayed through water sprayer.
4) Button is used to turn on/off the digger according to the requirement
5) Button is also provided for seeding on/off operation.
6) All input and output are received by receiver and transmitter.

J. Tool stability and durability
All the tools like cutter, digger , water sprayer and leveller have a long life span as compare to conventional machines, also this machine also offers easy substitution of tools it automatically indicates you whenever the tool Starts degrading. So the farmer will not be worried about changing of tools very frequently.

III. RESULTS AND DISCUSSIONS

The main aim of this project is to bring advancement in current technology which is used in agricultural field in order to have more productivity, less initialisation cost and less involvement of human. This multipurpose

Agricultural solar robot satisfies all the expected operations. The   main functions of this robot are digging, spraying and cultivation. The possibility of robotics is agriculture field is vast as in this field many manual or semi

Operating machines are operated which can be replaced by robotics to make agricultural activities profitable and less time consuming. This robot is very helpful for small farmers as this is cheaper so they will not have to

Buy or rent those conventional machines which are usually very expensive, so he can save more capital. Also solar energy make it more reliable for farmers.

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