

Design and Implementation of Intelligent Agricultural Robot Farming Using Solar Panel

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ABSTRACT

Nowadays, Automation robot is utilized in several of the fields such defence, police investigation, medical field, and industries etc. This paper says that, the robotic system develop to perform several multiple operation in agricultural land while not human effort. The aim of the paper is to cut back the human effort, time and additionally increase the productivity rate. All basic automation robot works like weeding, harvesting, fertilizing so on. Here the coming up with system operates seed sowing mechanism, watering the plant or spraying the chemical and navigate the vehicle motion also are most well-liked by this autonomous robot exploitation PIC microcontroller, we have a tendency to exploitation solar battery as an influence provision device that facilitate to convert solar power into electricity. By exploitation motor this electricity any regenerate into energy. This model named as "Autonomous Agriculture" supported movement of this golem within the land, the inaudible sensing element facilitate to notice the obstacle, thereby performs by turning the position of golem either in left or right direction before 100m. The navigation half are tired simulation with facilitate of proteus.

Keywords : Solar Panel, Motor Driver, Reset Switch, D.C Motor, PIC microcontroller.

I. INTRODUCTION

The agricultural technology need to find trending ways to improve the efficiency. One approach will utilize the available information technologies in the form of intelligent machines this may reduce the human efforts in effective ways compare to the past. In the current scenario many countries do not have sufficient skilled man power in agricultural sector and that affects the growth of developing countries. So farmers need to be use upgraded technology for cultivation activity (digging, seed sowing, fertilizing, spraying etc.). Now, It's time to use automate the

sector to overcome this problem. The advent of autonomous system gives us the opportunity to develop our country by a complete new range of agricultural equipment like small smart machines that can do the right thing, in right way. In India 80% of people depend upon agriculture. So we have to study in the bases on improving agricultural equipment. Innovative idea of our project is to automate the process of seed sowing crops such as sunflower, groundnut and vegetables etc., Depend upon the crop considering particular rows & specific columns the farm is cultivated by machine. The robotic system is an electromechanical and artificial agent which is

steered by DC motor, ultrasonic sensor it detects the obstacles in the path and it also senses turning position of vehicle at end of land before 100m and soil sensor is help to check the moisture level before the machine enter into the farm. The machine can be controlled by switch and solar panel used to charge DC battery. For programming the microcontroller assembly language is used. The PIC16F877A microcontroller control and monitor the motion of vehicle with the help of DC motor. The energy required for this robotic machine is less when compared to other machines like tractors or any other agriculture instrument, also this energy is generated by only solar energy which is found abundantly in nature. Pollution is causing a big problem so by using solar plate it will be eliminated.

II. LITERATURE REVIEW

Blackmore.S (2007) presents a style and development of Agricultural artificial intelligence. In the gift objective of seed planter machine style, factors touching seed emergence and a few mechanisms. The essential objective of seeding operation is to place the seed in rows at desired depth and canopy the seeds with soil to supply correct compaction over the seed. The counseled seed spacing and depth of seed placement vary from crop to crop and for various agro-climate to attain optimum yields. From this we all know that mechanical issue effects on seed germination like uniformity of placement of seed and uniformity of distribution of seed on rows. During this power transmission mechanism, seed meter mechanisms, weeder mechanism etc. The operating as machine is pushed; power wheel is rotating that transmit power to weeder through chain and sprocket mechanism. Currently cam is mounted on shaft which can push weeder towards downward direction. Once weeder is penetrate in soil and through backward stroke younger woman is opened so seed get separated from weeder and inserted in weed. From this we have a tendency to get a concept that if we use the belt having tiny holes with outlined

thickness then it's a useful for our project. As our useful vehicle is victimization for chain drives. During this paper author attracts our attention towards the performance issue of an influence tiller. Among those demand for lightweight weight power tiller was sought-after out most. Some parameters like fuel potency and volume unit also are mentioned. We have a tendency to think about these points whereas coming up with a property multifunctional agricultural vehicle.

Srinivasan R.Zanwar, R.D.Kokate (June 2012) explains the look of modification in useful sowing machine. In they present for sowing purpose we have a tendency to import the machinery that are bulk in size having additional value. To stop this they design style useful sowing machine that consists of hopper, seed metering mechanism, ground wheel, power gear, seed distributor, and tiller. They style the model on PRO-E software package. Truly the operating is incredibly easy once the tiller begin rotates it directly transmit motion into ground wheel which that directly connected through main shaft. A main shaft encompasses a disc with scoops within the hopper. Whereas ground wheel rotates the most shafts additionally rotates with the assistance of power gear. The scoops collect the seed from hopper and leave into the seed distributor. The tiller has superb contact with ground. During this the authors have used bound useful machine with facilitate of this paper we have a tendency to were ready to derive our attention to broader approach additionally however attachments may be used for creating a model additional economical and property way.

Swati D. S. Belsare He projected that the agricultural system in Republic of Asian nation should be advanced to chop back the efforts of farmers and various vary of operations area unit performed at intervals the agriculture like seed sowing, weeding, cutting, chemical spraying etc. really basic and vital operation is seed sowing. But this method of seed sowing area unit is extremely problematic. The equipment's used for seed sowing area unit are really

inconvenient to handle. Thus there's a need to develop instrument which might reduce the efforts offarmers. This methodology introduces a control mechanism the aim to drop seeds at specific location with the gap between a pair of seeds and contours. The drawbacks of the prevailing sowing machine were removed successfully throughout this automatic machine.

III. MATERIALS AND METHODS

The main aim of this paper is to develop a utile machine that is employed for creating by removal, seed sowing, and leveller to shut the mud and additionally water sprayer to spray water once least changes in accessories with minimum value. Therefore the full system of the automaton workswith the battery and also the solar energy

The diagram of robotic system in autonomous agriculture system victimisation solar battery is shown in figure one, It consists of

- PIC Micro Controller
- Ultrasonic Sensor
- Soil Moisture Sensor
- Robot
- Motor Driver
- LCD
- Seeding Motor
- Oscillator
- Relay

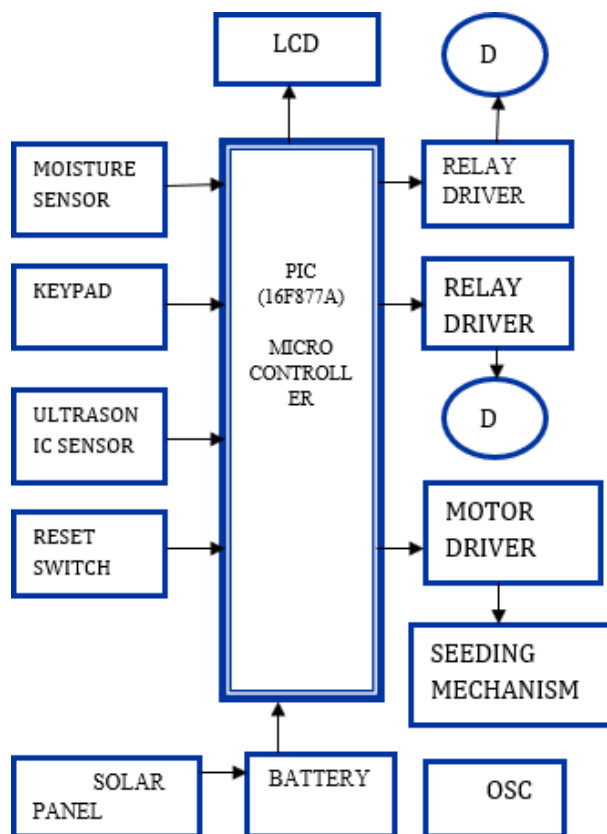


Fig 1. General Block diagram of Seeding Robot

PIC 16F877A Microcontroller is employed during this agribot. inaudible detector is employed to find the obstacles. Soil wet detector is employed to test the moisture content within the soil. Through liquid crystal display we tend to monitor the operating of agribot. Motor driver is employed to form the golem go into the farm. Pumping motor work is to pump the water into the agricultural field once the wet level is low.

- ✓ The bottom frame is created for the three wheels connected and driven the rear wheel is dc motor.
- ✓ One finish of the frame, cultivator is fitted that is additionally driven by dc motor and style is created to weed the soil.
- ✓ Hopper to store the seeds and therefore the seeds flow through the funnel through the trained hole on the shaft to the weed soil.
- ✓ On the top radical is fitted to shut the seeds to the soil, and pump sprayer to spray the water.

- ✓ Solar array is placed on high of the machine and is connected to the battery for charging the battery.
- ✓ So the easy lay potency is used from the sun by the solar array and to the battery. the entire machine can consume 12v battery to work the system.
- ✓ Toggle switches are accustomed management the operation of the vehicle.

The machine consists of the subsequent components:

- PIC Microcontroller- This PIC controller is incredibly convenient to use, the programming of this controller is additionally easier. One among the most blessings is that it will be write and erase as repeatedly as doable as a result of it use nonvolatile storage technology. Microcontroller has forty pins from that thirty three pins for input and output. PIC16F877A is employed in several PIC microcontroller project. it's several applications in digital electronic circuit.

Technical Specification:

- Operating Frequency is DC – 20MHZ
- Program Memory 8K.
- Data EEPROM memory 256 Bytes.
- Data Memory 368 Bytes.
- I/O Ports A, B, C, D, and E.
- Timers available in PIC16F877A are 3.
- 10-Bit Analog-to-Digital Module 8 Input Channels.
- Solar battery- Solar Panel provides renewable and eco-friendly supply of energy. It's created up from electrical phenomenon (PV) cells. It absorbs daylight and convert this solar power intocurrent.

Technical Specification:

- Rated Power (Pmax): 10W
- Nominal Voltage: 12V
- Restricted Warrantly: twelve Years

- Most Power: 10W
- Voltage at Pmax: sixteen.8V
- Current at Pmax: zero.59A
- Most system voltage: 50V

- DC Motor- An instantaneous current motor facilitate to convert into current into energy. 2 dc motors are used for driving the wheels connected to the automaton. L293d may be a dc motor driver used for driving dc motors. 200RPM Centre Shaft Economy Series DC Motor is top quality and it had low value DC double-gear motor. It's steel gears and pinions to confirm longer life with higher wear and tear properties. The gears and glued on hardened to confirm spindles polished to a mirror end. The output shaft rotates in a very plastic bushing. Therefore whole assembly is roofed with a plastic ring. Gearcase is sealed and lubricated with metal grease and no want of maintenance. The DC motor is screwed to the gear box from within. Though the motor gives two hundred revolutions per minute once twelve V however motor runs swimmingly from 4V to 12V and provides a large vary of revolutions per minute, and torque.

- Motor Drive- L293D may be a typical Motor driver or Motor Driver IC that permits DC motor to drive associate either direction. L293D may be a 16-pin IC which may able to management a group of 2 DC motors at the same time in any direction. It says that we are able to management 2 DC motor with one L293D IC. Twin H Bridge Motor Driver integrated circuit(IC). It acts as a current signal. This higher current signal is employed to dive the motors.

- Seed Hopper- The massive ends of frustums are connected to every alternative and 3 holes are created on the larger circumference of thehopper. Seeds are inserted within the solids with the assistance of capped openings on the face of frustum. Hopper can rotate regarding its central axis. Seed spacing are going to be maintained by the holes that are created on the circumference with equal distances.

- Moisture Sensor- Soil wet Sensor uses capacitance to live the water content of soil (by measure the insulator permittivity of the soil, that may be a perform of the water content).Merely insert this wet sensing element into the soil to be tested, and also the meter water content of the soil is rumored in %.

Technical Specification:

- Range: 0 to 45% volumetric water content in soil
- Accuracy: ±4% typical
- Typical Resolution: 0.1%
- Power: 3 MA @ 5VDC
- Operating temperature: -40°C to +60°C
- Dimensions: 8.9 cm × 1.8 cm × 0.7 cm (active sensor length 5 cm).
- Ultrasonic Sensor-: The supersonic device locomote module HC - SR04 is offer close to 2cm - 400cm, the locomote accuracy will touch 3mm. The module includes like supersonic transmitters, receiver and feedback loop. the essential principle of work:
 - Using IO trigger for a minimum of 10micro sec high level signal,
 - The Module mechanically sends eight forty kilocycle per second and sight whether or not there's a pulse signal back
 - IF the signal back, through high level , time of high output IO period is that the time from causation supersonic to returning

Technical Specification:

- Working Voltage -DC 5 V
- Working Current -15mA
- Working Frequency -40Hz
- Max Range -4m
- Min Range- 2cm
- Measuring Angle -15 degree
- Trigger Input Signal -10uS TTL pulse
- Echo Output Signal -Input TTL lever signal and the range in proportion
- Dimension- 45*20*15mm

- Relay- A relay is typically associate in Nursing mechanical device that is motivated by an

electrical current. The present flowing in one circuit can causes the gap or closing of another circuit. Relays are like remote switches and this was employed in several applications. During this project relay switch incorporates a coil that is driven by the NPN semiconductor unit. The coil of the relay switch gets energized thanks to the collector current of the semiconductor unit per thatswitch gets on and off to manage the water mechanical device.

- Liquid crystal display-The LCD receives the management signal from the microcontroller, it decodes the management signal and performs the corresponding actions on the liquid crystal display. It's used for displaying the quantity of fertilizers within the soil and also the amount of seeds being distributed in the soil.

➤ Technical Specification:

- Type: Character
- Display format: 16*2 characters.
- Built-in controller : ST 7066(or equivalent)
- Duty cycle: 1/16
- 5*8 dots include cursor.
- It requires +5V power supply.

- Keypad- Keypad consists to begin and a stop button. As before long because the user presses the beginning button the golem moves within the forward direction, then when reaching a specific distance its stops so dispenses a seed within the soil. This method continues till the user dose not press the stop button.

- Battery- A battery may be a device consisting of 1 or additional chemical science cells that convert hold on energy into current. Every cell contains a positive terminal, or cathode, and a negative, or anode. It'll enable current to emanate of the battery to perform work.

Technical Specification:

Battery: 7.5 Amp Hour 12 Volt Sealed Lead Acid Battery

IV. Flowchart

Figure 4 shows the flow of events for seeding mechanism. It consists of PIC microcontroller, DC motors with driver, LCD, magnet valve, relay and its driver. This is often associated with Autonomous agricultural golem. Here, as presently because the user presses the beginning button the golem starts occupying the forward direction. In Microcontroller, we've already programmed the robots operating. Once the golem starts occupying the onward motion when in few distance it stops and so it starts drilling with the assistance of a drilling mechanism. When this method, there's a magnet valve arrangement through that the seeds are being distributed within the soil.

The operations mentioned in below procedure:

Step 1 – Solar Panel provide power on the robot.

Step 2- Robot start moving into forward direction and all sensors powered on.

Step 3 – Ultrasonic sensors sense the unwanted grass (or) weeds to avoid.

Step 4 - If Ultrasonic sensor senses the presence of grasses then rotor starts rotating to cut grass plants.

Step 5 - Moisture sensor is used to check moisture level in the soil to water the plants.

Step 6 - If moisture sensor is low, then sensor turns on the water pump (or) if moisture is high, sensor turns off the water pump.

Step 7 - Repeat Step 3 to Step 6 randomly.

Step 8 - Switch is used to turn on plough share for digging the field.

Step 9 – LCD is used to view the scenario of operation.

The identical procedure continues till the user doesn't switch-off the circuit. Drilling method is finished with DC motor and seed dropping in land is done with the assistance of a 2 port magnet valve. These methods will display on liquid crystal display.

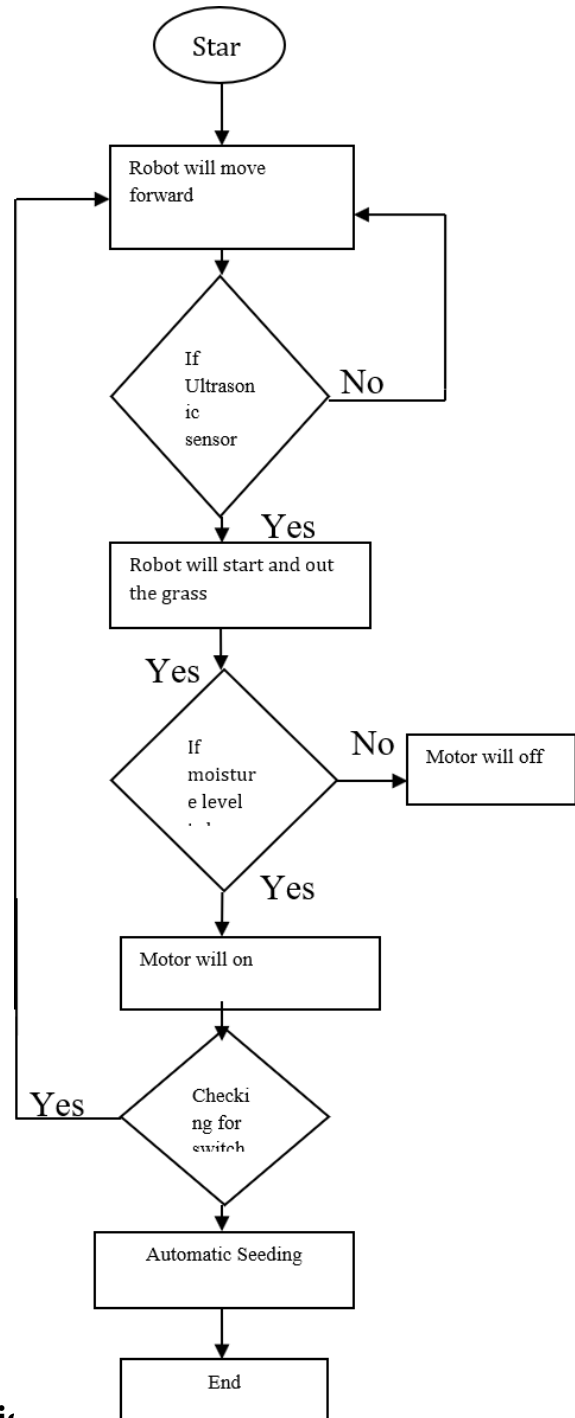


Fig 4. FLOW OF EVENTS FOR SEEDING mechanism

V. RESULTS AND DISCUSSION

Main objective of our automatic seeding operation is to create it additional economical and accurate in its working over ancient seed sowing ways. There are 3 major distances in seed sowing operation and these are excavation or sowing depth for seeds, distances between 2 crops and two rows.

Experiments can perform on the wet soil and distances lined by the golem are compared with predefined best distances. A sensible worth of 2 rows and two crops distances differs from theoretical values as 4cm to 8cm and 2cm to 3cm severally. Results of distances lined by Agribot are organized in tabular type within the table below. Agribot is additionally ready to notice the sphere finish by detective work the compound of the field. Accuracy obtained is satisfactory and may be improved by utilizing additional mechatronic style methodology, trendy controllers and advanced info systems.

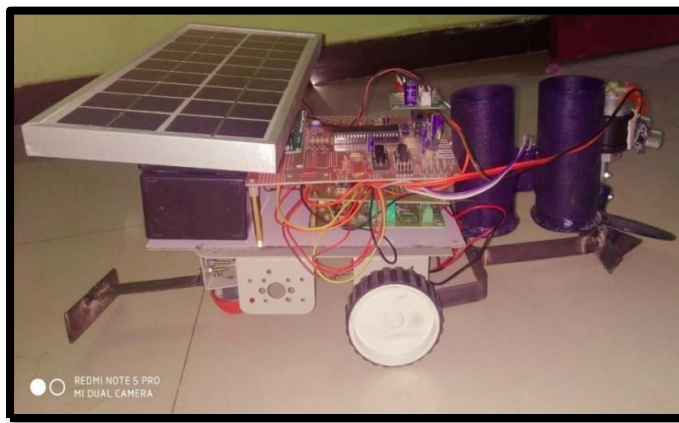


Fig 3: Snap shot of Agro-Bot

VI. CONCLUSION

In Bharat regarding 70th of the population lives in rural areas and their main supply of financial gain depends on agriculture sector. So, it's vital to own special concentrate on agriculture sector and to use latest technologies and strategies that are a lot of advance and economical. This may cause higher rate of growth of the country. It reduces sure tedious add agriculture associated therefore encourage many folks to require up agriculture as an occupation .In this regard, the project proposes associate agriculture vehicle that proves to be possible and economical to any or all categories of farmers World Health Organization do each giant scale and tiny scale farming. The vehicle is simple to work and user friendly. It conjointly helps the farmers in hit their target of high productivity together with secured farming. Our machine that treat solar energy compared to totally different ancient seed sowing strategies, It contain less manual power and by mistreatment electrical device no pollution can occur.

VII. FUTURE SCOPE

In future, the system will be changed for different farming tasks too like weeding and spraying processes with some mechanical coming up with modifications and It additionally run on PLC and SCADA with totally automatic. The powering system is modified from 12V lead acid battery to high power batteries. Addition of multi-hopper will be connected aspect by side for sowing of enormous farm. Introduction of Cutter in situ of drill will be used as grass cutter instrumentation.

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