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Agricultural Automation System with Field Assisting Robot-AgroBot

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Abstract

The agrarian business is a standout amongst the most critical industry for giving fuel to our survival.An important role is being played by the robots in the field of agriculture for farming purposes autonomously.The undertaking speaks to a thought which will help Indian ranchers where a robot (Agrobot) is intended to help agriculturists for agrarian purposes for our survival. It is mainly designed to minimize the labour of farmers in addition to accuracy of work and increase the speed. Here, an unequivocally working and a multitasking robot have been created, remembering the belief system that various little autonomous machines could be more productive than conventional substantial tractors and human exertion. Agrobot is a multifunctional robot that performs three noteworthy capacities typically required in Agriculture field i.e. Ploughing, Seed dispensing or spreading the fertilizer and harvester. Agrobot comprises of a control unit which chooses field estimation in length and breadth in the feat. After size determination of the field, a set capacity enters in the board permits choosing modes like Plowing, Seed circulation and Harvester. This is a working undertaking that has been totally amassed properly tried and employments Mechanical/Electrical/Electronics segments according to the necessity of the model of Agrobot.

Key Words

Arduino UNO, Wireless Camera, AV Radio receiver

Introduction

Agriculture is the backbone of India but Indias agricultural techniques are old and out-dated. Still, many places are there in India where very primitive ways and techniques are used. Dairy animals plough is utilized as a strategy for development at an expansive scale by Indian farmers. Utilization of substance composts, high yielding assortments of seeds, tractors and substantial machines are being utilized on an unimportant scale. Apply autonomy if presented in agricultural industry will assist and help our farmers to a certain degree. It significantly assumes an essential part of modern, restorative, military applications and some more. Agriculture apply autonomy in the utilization of robotization in bioframeworks, for example, farming, ranger service and fisheries keeping in see the major components of ascending of cost, inaccessibility of skilled labours and the absence of water assets. Applying computerization and automation to the field will enormously help in advanced creation in the industry which will help agriculturists to spare cash and time. Use of robotics in various functions of agriculture like ploughing, seed dispensing and harvesting, etc. will aid farmers in giving better results of productivity. Presently farmers are not getting better results because of non-use of robots in all agriculture functions. Conventional methods depend on manpower manually for dragging, lifting, weed control, fruit picking is being utilized in India. Farmers are inclined to work in the harmful environment while spraying chemicals and pesticides. While tractors that compact the muddy land as they are heavy and large and cannot move in terrain conditions. These techniques neglect to distinguish the harvest and soil in close closeness. A robotized and innovative agrarian framework (which utilizes field robot) is exemplified from above issues. Robots can work restlessly in all conditions according to the indicated program to perform required exercises with computerized help. The big advantage of lightweight robots is that they do not compact the muddy land as that of large machinery does. High-tech Automation with a camera fitted Field Assisting Robot in agriculture is a very simple technique where many instruments are coupled together which makes it easy for a farmer to irrigate and to keep an eye on the path on which the robot runs.

Problems Faced By Indian Agriculturists

The Indian farming is tormented by a few issues and some of them are normal and others are manmade.

1. The little and divided landholding.
2. The seeds and farming
   Seed is a fundamental contribution for attaining higher yields and the dispersion of guaranteed quality seed is critical as the creation of seeds and the nature of seeds are out of achieves and good quality seeds are difficult to identify
3. The absence of motorization
   The absence of automation of agribusiness in a few sec-

tions of the nation. The majority of the agricultural tasks in bigger parts is carried on by human hand utilizing simple and regular apparatuses like wooden plough sickle and so on. After freedom, Some advance has been made for automating agriculture in India and the green unrest in 1960 has been a requirement for mechanisation was uniquely felted. What's more, the increase was an aftereffect of expanding utilization of tractor control tiller and consolidate gatherer water system pumps and worker machines. In spite of the fact that India is the second biggest flooded nation in the world after China, 33 percent of the trimmed territory is the underwater system.

4. The soil disintegration
   The soil disintegration has vast tracts of rich land endure from soil disintegration by wind, rain and water. This territory must be dealt with and reestablished to its unique richness.
5. The deficient storerooms.
6. The composts manures and biocides.
7. The water system and ploughing.
8. Lack of lasting methods for water system.

Components

1. Arduino Uno

Figure 1: Arduino Uno.

It is a circuit board of credit card size. It consists of both a microcontroller which is the physical programmable circuit board and a software, or IDE (Integrated Development Environment). It keeps running on PC and is utilized to compose and transfer program code on a PC.
Arduino Uno Specifications

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 5-13V
- Output Voltage (limits): 7-21V
- Digital I/O Pins: 14 (out of which 6 provide PWM output)
- Analog Input Pins: 6;
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA;
- Flash Memory: 32 KB (ATmega328) out of which 0.5 KB is used by bootloader.
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

2. Motor Drivers LM293D

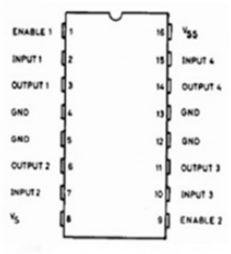

Figure 2: PIN Diagram.

Figure 3: Motor Driver LM293D.

The board uses a 5V supply. It is a double bridge driver. It is used to drive the motors. Here, mainly two motor drivers are used to drive the two DC motors which are used for the movement of the robot.

3. DC Motor

Mainly four DC motors are used. Two of them are attached to wheels to provide movement of the robot. The specification of this motor is:

- 12 Volt
- 30 rpm

Figure 4: DC Motor.

Another two motors have following specifications:

- 3 Volt
- 4280 rpm
  One of this type of motor is attached to the seed dispenser. Another motor is attached to the harvester at the front of the robot.

Figure 5: Another Configuration.

4. Regulator L7805CV

Two regulators of 5 volts and 8 volts are used to operate Arduino, motor drivers, LCD and switches, etc.

Figure 6: Regulator L7805CV.

5. LCD Display (16 x 2

It displays the functions and modes that the user want to apply.

6. Battery (12 volts)

Batteries are used to give supply to Arduino circuitry and radio receiver circuitry.

7. LED

It is used as a signal that the robot is in start mode.

Figure 7: LCD Display.

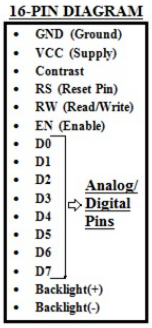

Figure 8: 16-Pin Diagram of LCD.

Figure 9: LED.

8.Resistor (1kilo ohm) and variable resistor

Figure 10: 1 Kilo ohm Resistor.

Figure 11: Variable Resistor.

The variable resistor is mainly used as the contrast adjust-

ment of LCD.

9. Wireless camera and Radio AV receiver

Figure 12: Wireless camera and Radio AV receiver.

10. TV Monitor

Used to monitor the path of the robot through a wireless network.

Figure 13: TV Monitor.

Model Description

The proposed robot is executed to help agriculturists in their agrarian fields. The controlling innovation of the whole framework is Arduino based, facilitate a camera is introduced in the hardware of the robot which will give a reasonable perspective of the way ahead and will likewise help the agriculturist to screen any obstruction on the off chance that the robot experiences in its way with the goal that any legitimate activity could be taken. The proposed framework has three main functions: Ploughing, seed dispensing and agriculture crop harvesting. On a circuit board Arduino Uno, two regulators (L7805C) of 5 volts and 8 volts, an LCD display (16 x 2), two motor drivers (LM293D), 1 kilo ohm resistor, a variable resistor (to adjust the contrast of LCD), a LED and along with four keys are connected to provide the electronic functioning of the robot.Two regulators of 5 volts and 8 volts are connected to the circuit board for the operation of other components in the circuit. LCD, Arduino, switches and other components are operated by 5 volts regulator while motor drivers are operated by the 8 volts regulator. Three 4 volts batteries are connected to each other in series which provide 12 volts input to Arduino, also it provides power to the wireless camera. On a wooden base, two DC motors of 30 rpm are attached on either side of the board which will be used as wheels for the robot to provide motion. Also, a freewheel is attached to the front of the board in order to provide easy movement of the robot. Two motor drivers(LM 293D) are used to drive the two Dc motors of 30 rpm. LCD will display the input given by the user, this input being the length or breadth of the field and also the mode in which the robot will function. This farming robot comprises of a control board for estimating length and expansiveness of field in the feat. There will be four keys which give diverse parts to play like a capacity enter permits in choosing mode i.e. ploughing, seeding and harvesting; two separate keys will give the client to increment or decrement the length and breadth and another key will give the client to reset all of the functions. The principle control rationale and programming will be done and will offer charges to the two motors through Arduino Uno to control the movement of the robot itself. Ploughing is finished utilizing a plougher which is a flat bar with various sharp thin cutting edges settled on it to plough, release the mud bed by breaking and turning over the mud. For the process of seed dispensing, the seeds which are stored in a dispenser are allowed to pass through an opening, from where the seeds are led to falling into the soil whose control is provided by Arduino. A DC motor of 3 volts, 4280 rpm is used to vibrate the dispenser in order to control the flow of seeds from the opening. When mode 1 is selected the vibrator will vibrate the seed dispenser for easy flow of seeds on the soil while the robot moves forward. Mode 2 is for the harvesting. For the operation of harvester another DC motor of 3 volts is used and it takes input from Arduino. The wireless camera introduced in front of the robot will send a signal to the receiver end where on a board, a radio AV receiver and a monitor TV are mounted alongside the 12 volts battery. The radio receiver gets a signal from the camera and demonstrates the checking video of the way of the robot on TV. Another arrangement of batteries gives power to the TV as well as the receiver. By this strategy, agriculturists can screen the robots way and will be simple for farmers to take necessary actions.

Block Diagram and Description

Block diagram consists of Arduino Uno, which is the heart of the project. It works on a 5 Volts supply. The robot is capable of performing multiple automatic operations like seed dispensing, harvesting and wireless monitoring. On the field, the monitoring mechanism of the robot is performed by the signals being conveyed from the wireless camera to receiver at the beneficiary end. DC motors are utilized for pivot of the wheels of the robot. These DC motors are driven by L293D engine drivers to control the direction and speed of the motor. Here, a camera is fixed to the front of the robot and is utilized to give checking of the way at the receiver

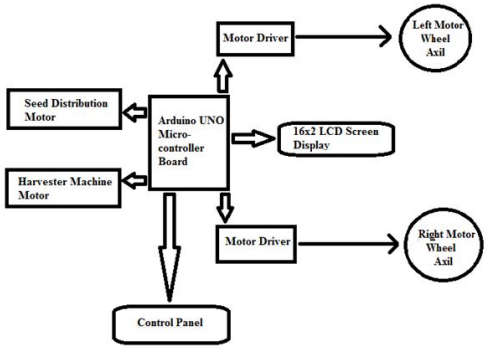

Figure 14: Block Diagram.

end through wireless signs.

Pin Diagram

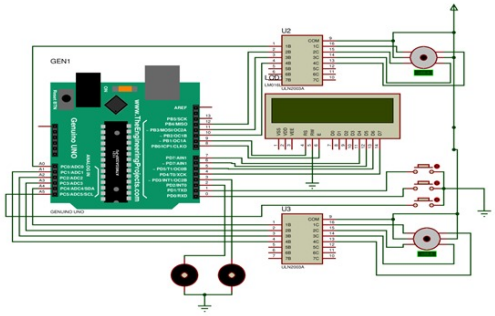

Figure 15: Pin Diagram.

Structure Developed

Agrobot and Receiver Module

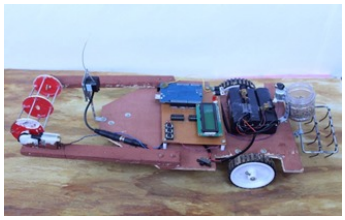

Figure 16: Side View.

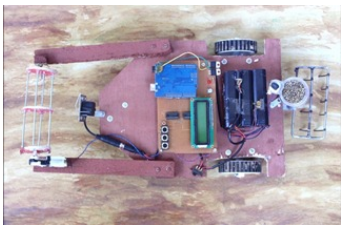

Figure 17: Top View.

Figure 18: Receiver Module.

Future Scope

The project can be actualized with tremendous outcomes in huge scale that will profit each farmer. Aside from seed dispensing, ploughing, harvesting and other cultivating processes like showering pesticides, fruit picking, and so forth can likewise be executed in one robot in this manner making the machine skilled multitasking. Raspberry Pi of most recent versions could be utilized rather than Arduino Uno for greater progression of the robot. The robot can be completely mechanized with the assistance of programmable logic controller(PLC) and even SCADA for more appropriate and progressed control of elements of robots over an extensive scale. In future, drones can likewise be included in order to dispense the seeds and also showering pesticides

Conclusion

The project aims for the improved development, design and manufacture of a multitasking robot which can perform programmed seed dispensing, harvesting, ploughing and camera observing. Vibration component utilized as a part of seed dispensing permits the control over the stream of seeds. This project proposed to diminish the prerequisite of substantial labour and cost of equipment producers and is moderate to agriculturists. The framework helps in the lessening of work expenses and confinements on working hours can be altogether progressed. The agrarian robot is intended to give assistance and help to the agriculturists. Once the idea of computerization and automation in agribusiness are acknowledged the selection rates will increment and the expenses of innovation will diminish.

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