Automated Seed Sowing Agribot Using Arduino

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***Abstract*- The Discovery of Agriculture is the first big step towards civilized life, advancement of agricultural tools is the basic trend of agricultural improvement. Now the qualitative approach of this project is to develop a system which minimizes the working cost and also reduces the time for digging operation and seed sowing operation by utilizing solar energy to run the agribot. In this machine, solar panel is used to capture solar energy and then it is converted into electrical energy which is used to charge battery, which then gives the necessary power to a shunt wound DC motor. Ultrasonic Sensor and Digital Compass Sensor are used with the help of Wi-Fi interface operated on Android Application to manoeuvre robot in the field. This brings down labour dependency. Seed sowing and digging robot will move on various ground contours and performs digging, sowing the seed and covers the ground by closing it. The paper spells out the complete installation of the agribot including hardware and software facet. Index Terms-Agribot, Arduino, Android application, Adafruit-IO, Seed sowing, Obstacle detection, Wi-Fi.**

INTRODUCTION

Today the environmental influence of agricultural production is very much in focus and the demands to the industry is increasing. In the present scenario, most of the cities in India do not have sufficient skilled man power in agricultural sector and that affects the progress of developing country. Therefore farmers have to use upgraded technology for cultivation activity (digging, seed sowing etc.).Seed sowing Machine which developed so far are operated manually or there is no Smartness of Work done by it expects seed sowing. Manual method includes broadcasting the seeds by hand. Sometimes method of dibbling i.e. making holes and dropping seeds by hand is used. Also a pair of bullocks is used to carry the heavy equipment of leveling and seed dropping. So it's time to automate the sector to overcome this problem. There is a need to study on upgrading agricultural equipment.

Innovative idea of this paper is doing the processes of digging and seed sowing of crops and covering the land automatically so that human efforts will get reduce up to 90 percent. Agricultural Robots or Agribot is a robot deployed for doing agricultural purposes. Pollution is also a big problem which is eliminated by using solar panel. The energy needed for robotic machine is less as compared with other machines like tractors or any agriculture tools; also this energy is getting from the solar energy which is found abundantly in nature. Nowadays robotics technology plays a paramount role in all Sections like medical field, industries and various organizations. In other countries robots are used to perform different operations in the agricultural field. The main application area of robots in agriculture is at the harvesting stage and Seed Sowing Stage.

CONCLUSION

- The seed sowing system is effectively use for automatic sowing with great efficiency and accuracy.
- Seed sowing of crops and covering the land automatically so that human efforts will get reduce.
- Also by using this system we can protect seeds from damaging as well as increases rate of sowing.
- The energy needed for robotic machine is less as compared with other machines like tractors or any agriculture tools; also this energy is getting from the solar energy which is found abundantly in nature.
- Reduce the manual work.
- Less skill technicians is sufficient to operate.

LITERATURE REVIEW

[1] Saurabh Umarkar and Anil Karwankar "Automated Seed Sowing Agribot", International Conference on Communication and Signal Processing, 978-1-5090-0396-9/16/$31.00 ©2016 IEEE.
In this machine, solar panel is used to capture solar energy and then it is converted into electrical energy which is used to charge battery, which then gives the necessary power to a shunt wound DC motor. Ultrasonic Sensor and Digital Compass Sensor are used with the help of Wi-Fi interface operated on Android Application. Seed sowing and digging robot will move on various ground contours and performs digging, sowing the seed and covers the ground by closing it.

[2] Amrita Sneha. A, Abirami. E,"Agricultural Robot for Automatic Ploughing and Seeding " 2015 IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2015) 978-1-4799-7758-1/15/$31.00 ©2015 IEEE.
This paper strives to develop a robot capable of performing operations like automatic ploughing, seed dispensing, fruit picking and pesticide spraying. The main component here is the AVR At mega microcontroller that supervises the entire process. Initially the robot tills the entire field and proceeds to ploughing, simultaneously dispensing seeds side by side. The device used for navigation is an ultrasonic sensor which continuously sends data to the microcontroller. On the field the robot operates on automated mode.

[3] Mangesh Koli "Seed Sowing Robot" International Journal of Computer Science Trends and Technology (IJCST) – Volume 5 Issue 2, Mar – Apr 2017.
The aim of the paper is to reduce the man power, time and increase the productivity rate. All the basic automation robot works like weeding, harvesting and so on. In current generation most of the countries do not have sufficient human factor in agricultural sector and it affects the growth of developing countries so it's time to automate the sector to overcome this problem. In India, there are 70% people dependent on agriculture. So we need to study the agriculture.

HARDWARE REQUIREMENTS

ARDUINO NANO:

Arduino Nano is the heart of system which is connected with all the sensors and other hardware assembly required to achieve the desire work. The features of Arduino Nano that it is a small, complete, and breadboard friendly board based on the ATmega328. The ATmega368 has 32 KB of flash memory for storing code in which 2 KB is used for the bootloader. The ATmega368 has 2 KB of SRAM and 1 KB of EEPROM. It is low cost and easily available controller. All the software programming is written in Arduino Integrated Development Environment (IDE). Arduino IDE is open-source software which makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. Interruptsare used in programming to make system more effective and respond to changes accordingly.

WI-FI MODULE

The Wi-Fi moduleCC3000 operated on adafruit-IO free server with the help of android application. It is Equipped with self-contained wireless processor that simplifies internet connectivity. It is an IEEE 802.11 b/g protocol with Wi-Fi Direct (P2P) and soft- AP. It uses SPI instead of UART so that communication will be faster. It is having Integrated TCP/IP protocol stack. Fig.1 shows Wi-Fi interface of module with Adafruit Server and Smartphone Android Application.

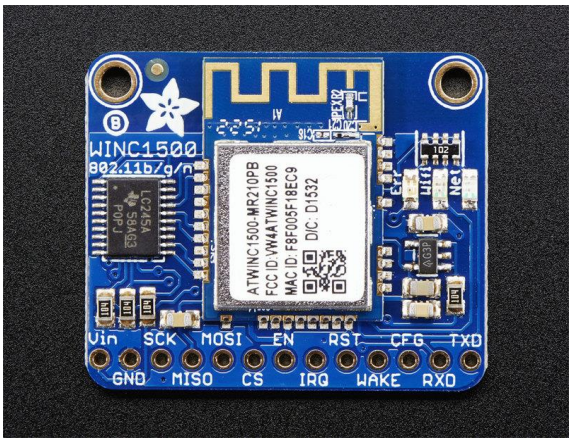

FIG. 1. Wi-Fi Module

POWER SUPPLY

The supply is taken from solar panel of 5 watt 12 V Output so as to fulfill the power requirement for the system. 12V lead- Acid battery is used to store the energy from solar Panel. when solar panel is kept in sunlight and voltage across it is greater than battery voltage, it will start storing the solar energy in the battery. Once the battery gets fully charged, the relay circuitry is on & it will break the connection between panel & battery.

FIG.2. Power Supply

OBSTACLE DETECTION

The important task of Agribot is Obstacle Detection. Fig. 3 depicts the ultrasonic sensor working with the help of waveforms. First waveform is Trigger, second is 8 consecutive clock pulses and third is time it takes to leave and return. Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function and the ranging accuracy can reach to 3mm which can be used for obstacle detection. The module includes ultrasonic transmitters, receiver and control circuit. The basic principle is by using trigger for at least 10us high level signal and then Module automatically sends eight 40 kHz cycle and detect whether there is a pulse sign

MOTOR DRIVER (L293D)

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

HALL EFFECT SENSOR

FIG.6. Hall Effect Sensors

Hall Effect Sensors consist basically of a thin piece of rectangular p-type semiconductor material such as gallium arsenide (GaAs), indium antimonide (InSb) or indium arsenide (InAs) passing a continuous current through itself. When the device is placed within a magnetic field, the magnetic flux lines exert a force on the semiconductor material which deflects the charge carriers, electrons and holes, to either side of the semiconductor slab. This movement of charge carriers is a result of the magnetic force they experience passing through the semiconductor material.

As these electrons and holes move side wards a potential difference is produced between the two sides of the semiconductor material by the build-up of these charge carriers. Then the movement of electrons through the semiconductor material is affected by the presence of an external magnetic field which is at right angles to it and this effect is greater in a flat rectangular shaped material.

SOFTWARE REQUIREMENT

Embedded 'C'

Embedded 'C' is a set of language extensions for the C Programming language by the C Standards

committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing. Embedded 'C' use most of the syntax and semantics of standard C, e.g main() function, variable definition, data type declaration, conditional statements loops functions, arrays and strings, structures and union, bit operations, macros, unions, etc. The 'C' Programming Language was originally developed for and implemented on the UNIX operating system, by Dennis Ritchie in 1971.

Characteristic of an Embedded 'C' programming environment:

- Special keywords and tokens (@, interrupt, tiny).
- Many different pointer kinds (far / near / rom / uni).
- Critical timing (Interrupt Service Routines, tasks)
- Hardware oriented programming

ARDUINO IDE SOFTWARE

- IDE stands for integrated development environment. It is a computer program that encompasses the tools required by programmers to develop software. Common elements found in an IDE include a source code editor, compiler, builder and debugger.
- Programmers use IDEs over simple text editors because of the convenience they provide when writing code. Examples of IDEs include Visual Studio Express, Eclipse and Net Beans. Every IDE has its unique features and benefits, along with their own drawbacks. IDEs have specific language support, with some being limited to only one programming language. They also vary according to the different kinds of software development, such as mobile, web and desktop.

APPLICATION

- This equipment can be made self-propelled by attaching an IC engine to it, further
- improvement in design of wheels and individual end effectors will make this
- equipment more efficient and effective such as:
  1. Hardening of required end effectors.
  2. More precise mechanism for seed sowing and fertilizing such as cam and shaft arrangement or spring and plate arrangement.
  3. Involving hydraulics in the working of ploughs.
  4. Size of the machine must be increased to use it in large field areas.

ADVANTAGES

1) Reduce the manual work**.**
   Anyone that has ever had the task of relocating a fixed con-visor system knows that this can be a cumbersome under-taking. Through the use of advanced ASSR technology and wireless routing, vehicles can be quickly reprogrammed to change path or operation, eliminating the need for expensive retrofitting. New directions, tasks, and work cells can be created almost instantaneously without the need for physical equipment installation.
2) Less skill technicians is sufficient to operate**.**
   Through the advancement of control systems ASSRs offer a safe and predictable method of delivery, while avoiding interference with human and building factors. ASSRs can operate almost around the clock, without the need for breaks and vacation time. In addition, ASSRs operate in conditions that may not be suitable for human operators, such as extreme temperatures and hazardous environments.
3) Installation is simplified very much
   Automated Seed Sowing, combined with RF technology, interface with the Warehouse Control System or Warehouse Management System to improve accuracy and efficiency. ASSRs have little downtime, and operate at a fixed rate to meet a predictable metric for operational activity.
4) Labour requirement reduces

Optimization of transport flows in accordance with vehicle fleet, traffic and missions. Work flows distributed dynamically between the same ASSRs. Possibility of 24/7 operation without human intervention.

5) Quantity of seeds reduce

No conventional material-handling infrastructures required. Increase of ASSRs in line with the growth in volume of operations. Updating possible without shutting down the system. Easy reconfiguration of routes or addition of new machines. Reintroduction of vehicles after manual repositioning. Playhouse Seeds are broadcasted on the soil which results in the loss & damage of the seeds. As the cost of seeds is more & can't affordable for the farmers so there is the need for the proper placement of seeds in the soil.