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IoT Based Multipurpose Seed Sowing Agribot

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ABSTRACT: Today's era is marching towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers have to implement the new technique which will not affect the soil texture but will increase the overall crop productions. In seed sowing machine system, there are battery powered and DC geared motor. When any obstacle comes in-front of machine or divert path the seed sowing machine can detect this obstacle very easily using ultrasonic sensor. For the rotations of rotating wheel there is seed falls from this seed roller and the seed plantation process can take place smoothly as well as without wastage of seeds. This advancement in technology will not affect the quality of soil and increase the efficiency of getting crop. The required row to row spacing, seed rate, seed to seed spacing varies from crop to crop can be achieved by the proposed machine. This machine reduces the sowing time, human effort and labour cost.

KEYWORDS_Agribot, Seed Sowing Machine, IoT.

I. INTRODUCTION

The Discovery of Agriculture and development in farming is the first big step towards civilized life. Advancement of farming tools is the basic trend of agricultural improvement. Sowing is the most important process in farming. It is a very tiring and time consuming process that requires a lot of human effort. Here we propose the design and fabrication of a fully automatic seed sowing robot that automates this task. The growth or development of any nation in the world is purely depends up on the agriculture production. Traditional methods of sowing seeds manually consume lot of time and also it may not be accurate because of human errors. In this regard to enhance the technology in the field of sowing machines, mainly to increase the sowing efficiency. Soil preparation is the process of ploughing, levelling, and manuring to prepare the soil for growing a crop. Sowing is the primary stage of sowing and can be done manually, by hand, or by using seed drilling machines. Manuring is the step where nutritional supplements are provided, either natural (manure) or chemical compounds (fertilizers). Other methods for soil replenishment include vermicompost, crop rotation, and planting of leguminous plants. Irrigation is the supply of water from sources such as wells, ponds, lakes, canals, dams, etc. Over irrigation can lead to waterlogging and damage the crop. Weeding is the removal of unwanted plants, harvesting is the cutting and gathered of the crop, and storage is the storage of grains. To protect grains from pest and rodents, cleaning, drying, fumigation, etc., are done prior to storing. Out of these many steps, the most time consuming method is soil preparation and seed sowing method. Soil preparation method includes ploughing and levelling after seed sowing. Seed sowing manually leads to waste of many seeds and not more effective. To overcome all these problems an IoT based multipurpose seed sowing machine is designed and fabricated to perform the process soil preparation and seed sowing at a time.

II. LITERATURE SURVEY

Kannan A et al. [1]: This research paper presents design modification in multipurpose sowing machine. In this they present that for sowing purpose we import the machinery which are bulk in size having more cost. To prevent this they design multipurpose sowing machine which consists of hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller. In this they design model on PRO-E software. Actually the working is very simple as the tiller rotates it directly transmit motion to ground wheel which directly connected through main shaft. A main shaft has a disc with scoops inside the hopper. When the ground wheel rotates the main shaft also rotates



with the help of power transmission system. The scoops collect the seed from hopper and leave it inside the seed distributor. The tiller is having very good contact with ground.

Saurabh Umalkar Anil Karwankar et al. [2]: In this research paper discussed that the process of seed sowing is a key component of agriculture field. For many crop varieties, high-precision pneumatic planting has been developed for a wide range of seed sizes, resulting to uniform seed distribution in seed spacing along the travel path. Wi-Fi is used as receiver. Main disadvantage of the system is robot moves in only one direction. Whenever there is obstacle power supply is automatically turned OFF. 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.

Marode A et al. [3]: This research paper represents “Design & Implementation of Multi Seed Sowing Machine”. In this paper gives types sowing machine. The following are the three different types of seed sowing, Broadcasting: A field is initially prepared with a plough to a series of linear cuts known as furrows. The field is then seeded by throwing the seeds over the field, a method known as manual broadcasting. The result was a field planted roughly in rows, but having a large number of plants. When the seeds are scattered randomly with the help of hand on the soil, the method is called broadcasting. Dribbling: Drill sowing and dribbling (making small holes in the ground for seeds) are better method of sowing the seeds. Once the seeds are put in the holes, they are then covered with the soil. This saves time and labour and prevents the damage of seeds by birds. Another method of sowing the seeds is with the help of a simple device consisting of bamboo tube with a funnel on it attached to a plough. As the plough moves over the field the tube attached to it leaves the seeds kept in the funnel at proper spacing and depth. The plough keeps making furrows in the soil in which the seeds are dropped by the seeds drill.

Mahesh R. Pundkar et al. [4]: It stated that the seed sowing machine is a key component of agriculture field. high precision pneumatic planters have been developed for many varieties of crops, for a widerange of seed sizes, resulting to uniform seeds distribution along the travel path, in seedspacing.

R. D. Kokate et al. [5]: This article addresses the advanced system which improves agriculture processes like cultivation on ploughed land, based on robotic platform. We have developed a robotic vehicle having four wheels and steered by DC motor. The advanced autonomous system architecture gives us the opportunity to develop a complete new range of agricultural equipment based on small smart machines. The machine will cultivate the farm by considering particular rows and specific column at fixed distance depending on crop. The obstacle detection problem will also be considered, sensed by infrared sensor. The whole algorithm, calculation, processing, monitoring are designed with motors & sensor interfaced with microcontroller. The result obtained through example activation unit is also presented. The dc motor simulation with feedforward and feedback technique shows precise output. With the help of two examples, a DC motor.

Baghyaveereswaran et al. [6]: Agriculture is the primary occupation of our country India. With the technological advancement in all spheres, agriculture has also witnessed developments with the introduction of robotics and automation. The paper presents the idea of a robot which simplifies the process of farming. The primary elements of the robot are a microcontroller and a mobile application. The robot is equipped with a soil moisture measuring sensor for measuring soil conditions, gripper arrangement for plucking of crops and sowing of seeds, a camera sensor for crop monitoring, a combination of Bluetooth module, magnetometer and a GPS module for providing GPS based navigation to the robot. The first job of the robot will be to plough the field and gather information about the soil. Next task is to sow the seeds and monitor and last will be to harvest the crops. All this process can be controlled by the mobile application which is remotely placed. This robot helps in automatic agriculture and also saves great deal of laborious work and repetitive tasks of a farmer.

Jayashree. S. Awati et al. [7]: In this project work focused on seed sowing processes and tried to solve the problem. In seed sowing machine system, they are used battery powered wheels and dc motor inbuilt in these wheels. When the seeds are empty it detects the level of storage seed and indicates the alarm. When any obstacle comes in the in-front of machine or divert path the seed sowing machine can detect this obstacle very easily. In each complete rotation of rotating wheel there is seeds falls from this seed drum and the seed plantation process can take place smoothly as well



as without wastage of seeds. The end of system machine reached and it create alarm. This system provides all the facility which can work efficiently.

K.Saravanan , S.P. Sundar Singh Sivam et al. [8]: In Today era is marching towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the overall crop production. The aim of this project is to design and develop an Automatic seed sowing robot for Chickpeas Seed. The Chickpeas Seed sowing machine is a key component of agricultural field. The various technique used in India for seed sowing and fertilizer placement are manual, ox and tractor operator. The manual and ox operator technique are time consuming and productivity is low. The approach of this project is to develop the automatic Chickpeas Seed sowing robot which is to minimize the working cost and the time for digging as well as operate on clean energy. In this robot proximity sensor is used to convert rotations to distance with a 12V battery, which then gives the necessary power to a DC wiper motor. This power is then transmitted to the shaft to drive the wheels.

M.Aravind Kumar, K. Sagadevan et al. [9]: The zone of horticulture is so wide, thusly this field requires the advance technologies in the process of sowing, cropping, cutting& irrigation. So, the disclosure of Agriculture is the primary enormous advance towards acculturated life. Advancement in agricultural tools, is the fundamental pattern of rural change. This advancement in technology will not affect the nature of soil and increase the efficiency of getting crop. Nowadays the accessibility of work is a major problem faced by farmer. The proposed machine limits the working expense and furthermore decreases the ideal opportunity for burrowing seed sowing & irrigation operations by utilizing solar energy to operate the agrobot. An adequate water supply is important for plant growth. When rainfall is not sufficient, the plants need additional water. Our undertaking encourages the ranchers to inundate the farmland in a proficiency route with computerized water system framework in view of soil dampness sensor. It depends on the edge esteem and the sensor esteems. This water system averts soil disintegration, spare water and can likewise supply manure to crops. The most essential procedure is it permits water preservation as water provided in a focused-on way close to the root zone. Seed sowing, digging & irrigation robot will proceed onward different ground shapes and performs burrowing, sowing the seed and gives a good environment for proper growth.

Thorat Swapnil V, Madhu L. Kasturi et al. [10]: Sowing machine should be suitable to all farms, all types of corps, robust construction, also is should be reliable, this is basic requirement of sowing machine. Thus, we made sowing machine which is operated manually but reduces the efforts of farmers thus increasing the efficiency of planting also reduces the problem encountered in manual planting. For this machine we can plant different types and different sizes of seeds also we can vary the space between two seeds while planting. This also increased the planting efficiency and accuracy. We made it from raw materials thus it was so cheap and very usable for small scale farmers. For effective handling of the machine by any farmer or by any untrained worker we simplified its design. Also, its adjusting and maintenance method also simplified.

III. PROBLEM STATEMENT

In the present scenario most of the countries do not have sufficient skilled man power in agricultural sector and that affects the growth of developing countries. Therefore, farmers have to use upgraded technology for cultivation activity (digging, seed sowing, fertilizing, spraying etc.). In traditional method of sowing seed, a lot of time requires for the whole seed sowing process. In manual seeding method, lot of seeds get wasted due to not getting sowed in tilled lane. So, it's a time to automate the agricultural sector to overcome this problem which in turn will also eliminate the requirement of Labors and also avoid the wastage of seeds.

IV. METHODOLOGY

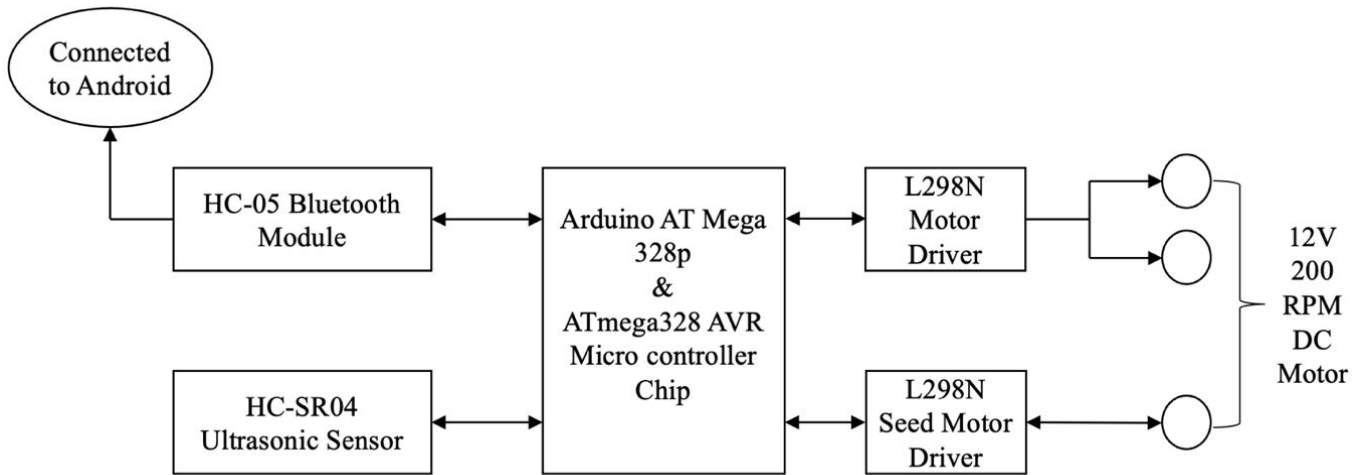


Fig 1. Block diagram of IoT based Agribot

The system mainly consists of HC05 bluetooth module which is connected to an android phone through an Bluetooth RC controller app. The HCSR04 ultrasonic sensor acquires the data of any obstacles ahead and sends the signal to controller and stops the agribot to change the direction. The four side motion, front, back, right and left side of an agribot is controlled through an android phone. All the instruction codes are developed and inputted to the Arduino AT Mega 328p.

V. MATERIALS USED

A. Arduino AT Mega 328p

We are using an ATmega328 micro controller chip found on Arduino Uno boards. ATmega328 micro controllers are from the 8-bit AVR micro controller family. The image below shows an AVR ATmega328 micro controller chip. The exact part number of this chip is ATMEGA328P-PU as found printed on the top of the chip

B. ATmega328 AVR Micro controller Chip

ATmega328P is a high performance yet low power consumption 8-bit AVR microcontroller that's able to achieve the most single clock cycle execution of 131 powerful instructions thanks to its advanced RISC architecture. It can commonly be found as a processor in Arduino boards such as Arduino Fio and Arduino Uno.

C. DC Geared Motor

Direct Current (DC) motor is a rotating electrical device that converts direct current, of electrical energy, into mechanical energy. A gear motor is an all-in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output. The most important parameters in regards to gear motors are speed (rpm), torque (kg-m) and efficiency.

D. Motor Driver

The L298 is an integrated monolithic circuit in a 15-lead Multi-watt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors.

E. HCO5 Bluetooth Module

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC. It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications. It has range up to <10m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions. It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air. It uses serial communication to communicate with devices. It communicates with microcontroller using serial port.

F. Lead Acid Battery

The lead–acid battery is a type of rechargeable battery first invented in 1859 by French physicist Gaston Plante. It is the first type of rechargeable battery ever created. Compared to modern rechargeable batteries, lead–acid batteries have relatively low energy density. Despite this, their ability to supply high surge currents means that the cells have a relatively large power-to-weight ratio. These features, along with their low cost, make them attractive for use in motor vehicles to provide the high current required by starter motors. As they are inexpensive compared to newer technologies, lead–acid batteries are widely used even when surge current is not important and other designs could provide higher energy densities. In the charged state, the chemical energy of the battery is stored in the potential difference between the pure lead at the negative side and PbO₂ on the positive side.

G. Ultrasonic sensor

The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar. It's ideal for any robotics projects you have which require you to avoid objects, by detecting how close they are you can steer away from them. An HC-SR04 ultrasonic distance sensor actually consists of two ultrasonic transducers. One acts as a transmitter that converts the electrical signal into 40 KHz ultrasonic sound pulses. The other acts as a receiver and listens for the transmitted pulses. HC-SR04 distance sensor is commonly used with both microcontroller and microprocessor platforms like Arduino, ARM, PIC, Raspberry Pie etc. The following guide is universally since it has to be followed irrespective of the type of computational device used. Power the Sensor using a regulated +5V through the Vcc and Ground pins of the sensor.

H. Seed Hopper

Hopper is a container that is used to store the seeds and transfers the fixed amount of seeds into the metering wheel. Hopper is made up of plastic.

I. Soil Filler

Soil filler is a mechanism which is used to fill the soil which has been dragged away by the digger after placing the seeds.

VI. DESIGN OF MODEL

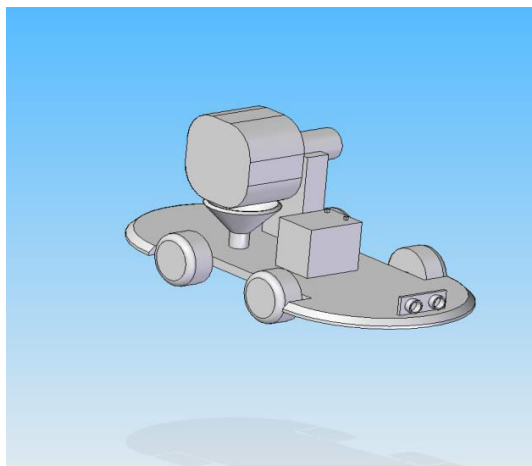


Fig 2. 3D Model

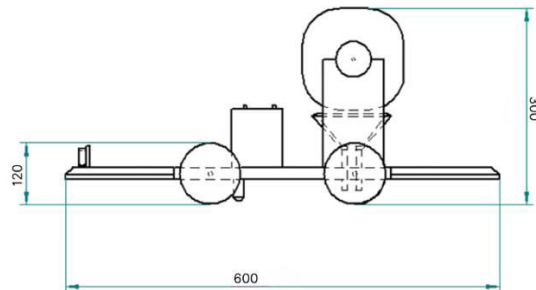


Fig 3. Side view

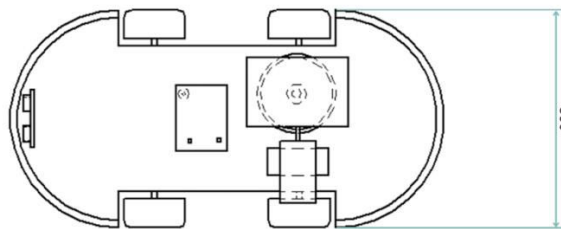


Fig 4. Top view

VII. FUTURE SCOPE

Addition of multiple hopper can be attached side by side for sowing the large farm. The work may be done by extending the range of Bluetooth for communication in large farm. Also connection of the water sprinkler can be used to moisture the soil. The system can be advanced for checking the moisture of farming land by moisture sensor and adjust the particular amount of water in soil (i.e. moisture of soil) according to seed and its requirement. It can automatically increase the moisture of soil in land, when providing water supply to this system. It can be also used fertilizer sowing instead of seed. The system can further be modified to measuring various parameter in farming like crop growth, seed prevalence, its type etc.

VIII. CONCLUSION

India is the second largest producer of vegetables in the world next only to China. As per National Horticulture Board database the vegetable production was 169.1 million metric tons in 2014-15 contributing 14.0% of world's total vegetable production. Innovative Seed sowing equipment's has remarkable influence in agriculture. By using this innovative project of seed sowing equipment we can save more time required for sowing process and also it reduces lot of laborer cost. It is very helpful for small scale farmers. Performs the various simultaneous operations and hence saves labor requirement such as labor cost, labor time and also save lots of energy. Hence it is easily affordable by farmers. So we feel that this project serves something good to this world and we would like to present it before this prosperous world. The microcontroller is used to control and monitoring the process of the system motion of the vehicle. It is controlled with the help of DC motor. This system also detect obstacles present in the path of the vehicle by ultrasonic sensor. It is also used for sensing turning position of the vehicle at the end of land. Because if no man power requirement and high speed of operation, it has scope for further expansion. This machine can be made by raw materials that save the cost of the whole project. It can also be easily manufactured. By using this machine, we can achieve flexibility of distance and controlled depth variation for different seeds and hence it is useful for all types of seeds.



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