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Smartphone Operated Multipurpose Agriculture Robot

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Abstract: ***Many countries in Asia including are agrarian economies and most of their rural populations depend on agriculture to earn their livelihood. Aimed at increasing the productivity and reducing the labour involved, this robot is designed to execute the basic functions required to be carried out in farms. We aim to create a multitasking agriculture robot which will focus on basic work of plantation. To sow the seeds a robotic arm will dig to a precise depth with equal distance between the seeds. At bottom of robot water pump will be placed and as per the requirement water will be sprinkled. This project aims to design an agriculture robot, which helps the people to survive where it performs operations such as digging of soil, sowing of seeds, spraying water and cutting the plants. In previous projects the technique used were complicated as well as expensive.***
Keywords: Wi-Fi Module, Microprocessor, Arduino UNO, IP Camera, L293D-R1 Motor Driver, Solar Panel.

I. INTRODUCTION

In India generally, the traditional seed sowing methods includes the use of animal drawn funnel pipes driller or drilling using tractor. The emphasis in the development of autonomous Field Robots is currently on speed, energy efficiency, sensors for guidance accuracy and enabling technologies such as wireless communication and GPS. Earlier method requires labor and a very time and energy consuming. Where as in tractor based drilling operators of such power units are exposed to high level of noise and vibration, which are detrimental to health and work performance. In olden days technology was not developed that much. So, they were seeding by hand. But nowadays technology is developed. By using robot technology, one can sit in a cool place and can do seeding by monitoring the robot motion.So now it's not necessary to do seeding in sunlight.

In recent years, robotics in agriculture sector with its implementation based on precision agriculture concept is the newly emerging technology. Designing of such robots is modeled based on particular approach and certain considerations of agriculture environment in which it is going to work. The main reason behind automation of farming processes are saving the time and energy required for performing repetitive farming tasks and increasing the productivity of yield by treating every crop individually using precision farming concept .

Agribot is a robot designed for agricultural purpose. It is designed to minimize the labor of farmers in addition to increasing the speed and accuracy of the work. It performs the elementary functions involved in farming i.e. ploughing the field, sowing of seeds, covering the seeds with soil and water sprinkling. In India agriculture is the backbone of economy. 50% of the population is involved in farming activities directly appear on the plant leaves.

In the current scenario most of the countries do not have sufficient skilled manpower specifically in agricultural sector and it affects the growth of developing countries. So it's a time to automate the sector to overcome this problem. An innovative idea of our project is to automate the process of sowing crops such as sunflower, baby corn, groundnut, cotton and vegetables like beans, lady's finger, pumpkin and pulses like black gram, green gram etc. to reduce the human effort and increase the yield.The plantations of seeds are automatically done by using DC motor. The distance between the two seeds are controlled and varied by using Microcontroller. It is also possible to cultivate different kinds of seeds with different distance. Also the project consists of sprinkler, which would be used for reducing the wastage of fertilizers that is done by spraying appropriate amount of fertilizers required for the particular crop. The sprinkler would sprinkle on the senses from wheel movement and the on and off of the sprinkler would be controlled by Microcontroller.

When the Robot reaches the end of the field we can change the direction with the help of remote switches. The whole process is controlled by Microcontroller. A general- purpose autonomous robotic control system designed for agriculture field applications has four core abilities: guidance, detection, action and mapping which are considered in the designing according to the application requirement. Some of the major operations in farming which are under research and automation are seeding, plugging, digging, leveling, pesticides spraying, water spraying.

When it comes to designing a robot for automating these operations based on this for seeding process robot must be able to move in straightway properly on bumpy roads of farm field, soil moisture content may affect the soil digging function, sensors to be selected for the system must be chosen by considering farming environmental effects on their working. Apart these other requirements are in terms of accuracy required in the task and these are: digging depth, particular optimal distance between rows and plants for certain type of crop, rows to be sown at a time and accurate navigation in the field. Whereas other processes like sprinkling weeding these functions depends on seeding stage by knowing the exact location of crop and the making those operations on it accordingly. When considering the physical aspect of the vehicle or the robotic system, farmer's present condition in particular area plays a major role in designing these aspects.

II. RELATED WORK

Mr. Amit Kumar K, Mr. Rohit D Kumar, Mr. Suyog Deshpande, Mr. Vinayak Shintre, Mr. Vishal Parit [3] reported that in the current scenario most of the countries do not have sufficient skilled manpower specifically in agricultural sector and it affects the growth of developing countries. So it's a time to automate the sector to overcome this problem. An innovative idea of our project is to automate the process of sowing crops such as sunflower, baby corn, groundnut, cotton and vegetables like beans, lady's finger, pumpkin and pulses like black gram, green gram etc to reduce the human effort and increase the yield. The plantations of seeds are automatically done by using DC motor. The distance between the two seeds are controlled and varied by using Microcontroller. It is also possible to cultivate different kinds of seeds with different distance. Also the project consists of sprinkler, which would be used for reducing the wastage of fertilizers that is done by spraying appropriate amount of fertilizers required for the particular crop. The sprinkler would sprinkle on the senses from wheel movement and the on and off of the sprinkler would be controlled by Microcontroller. When the Robot reaches the end of the field we can change the direction with the help of remote switches. The whole process is controlled by Microcontroller.

Blackmore, B. S., Stout, W., Wang, M., and Runov, B.[2] reported that Developed agriculture needs to find new ways to improve efficiency. One approach is to utilise available information technologies in the form of more intelligent machines to reduce and target energy inputs in more effective ways than in the past. Precision Farming has shown benefits of this approach but we can now move towards a new generation of equipment. The advent of autonomous system architectures gives us the opportunity to develop a complete new range of agricultural equipment based on small smart machines that can do the right thing, in the right place, at the right time in the right way.

Suraj Chavan, Anilkumar Dongare, Pooja Arabale, Usha suryanwanshi, Sheetal Nirve [3] reported that many countries in Asia including India are agrarian economies and most of their rural populations depend on agriculture to earn their livelihood. Aimed at increasing the productivity and reducing the labor involved, this robot is designed to execute the basic functions required to be carried out in farms. We aim to create a multitasking agriculture robot which will focus on basic work of plantation. To sow the seeds a robotic arm will dig to a precise depth with equal distance between the seeds. At bottom of robot water pump will be placed and as per the requirement water will be sprinkled. The right amount of fertilizer will be spread over the seed.

III.METHODOLOGY

Many of the systems designed for agriculture operations of seeding, digging, cutting, and water spraying, fertilizer spraying are based on the machine vision. The navigation of the vehicle is based on Wi-Fi wireless controlled system. Use of these systems can achieve the level of accuracy but the final cost of the product is very high. The system proposed in this project is cost effective and does not require the costly equipment's for its navigation; it is designed to be automatic and light weight. These advantages make it real aid to farmers.

AGRIBOT can be used for the following purposes.

1) Agribot can even sow the seeds according to the program and the distance set between the seeds.
2) Agribot also cuts the plants after it is grown.
3) Agribot also sprinkles the water for the sowed seeds so that it takes how much amount of water is needed to that seeds or plants.
4) Agribot can plough the seeds automatically.

These are the few methods where the developed model works automatically after it is programmed which can be mainly helpful for the farmers.

A. Algorithm Used

1) Step 1 - Power on the robot.
2) Step 2- Robot starts moving forward and all sensors powered on.
3) Step 3 - IR sensors senses for unwanted grass (or) weeds.
4) Step 4 - If IR sensor sense the presence of weeds (or) grasses then rotor starts rotating to cut grass (or) weed plants.
5) Step 5 - Moisture sensor is used to check moistness in the soil to water the plants.
6) Step 6 - If moisture sensor is low, sensor turns on the water pump (or) if moisture is high, sensor turns off the water pump.
7) Step 7 - Repeat Step 3 to Step 6 periodically.
8) Step 8 - Switch is used to turn on ploughshare for digging the field (or) farm.
9) Step 9 - Smart phone is connected to robot through Wi-Fi interface app.
10) Step 10 - Robot can operate during night using IP camera.

IV. EXPERIMENTAL RESULTS

The hardware components are successfully interfaced with the micro-controller.Test results shows that the various field activities like ploughing, sowing seeds , irrigation, obstacle detection and obstacle clearance are performed and controlled with the help of Wi-Fi module. The results that have been produced from the improved agricultural robot are the following: increased biodiversity, increased productivity, and increased profits. Improved agricultural robot aim to produce food for consumers that are safe and wholesome . Fig 1 and Fig 2 shows the final agricultue robot made.

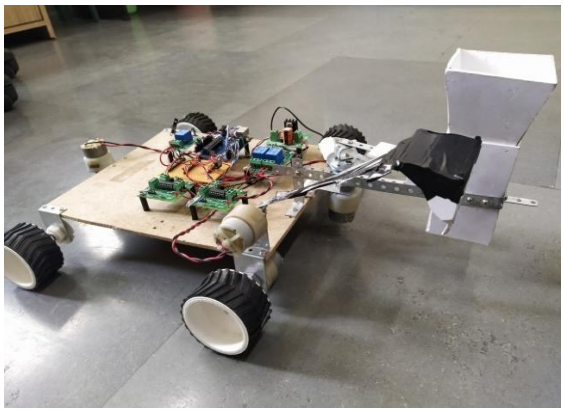

Fig 1

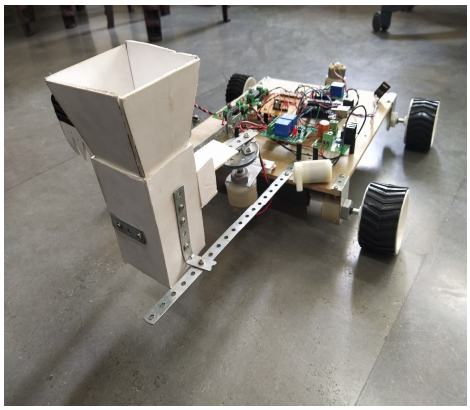

Fig 2

V. CONCLUSIONS

It has been concluded that, the main objective of this AGRIBOT is to facilitate the farmers to ease their work and increase the productivity with its multitasking working features such as seeding, sowing, ploughing, sprinkling, cutting with checking the intensity of light and the moisture level of soil these advanced features overcomes the difficulty of farmers in farming their land in any climatic condition irrespective of day and night, the main aim of this project is to initiate an embedded system based application for multipurpose working used for smart farming.

It is being initiated by integrating features from all the hardware components uses, all the modules are being considered out and arranged carefully thus contributing to the best working of the unit. These AGRIBOTS are the boon to today's farmers for the effortless and time saving farming with increase in production.

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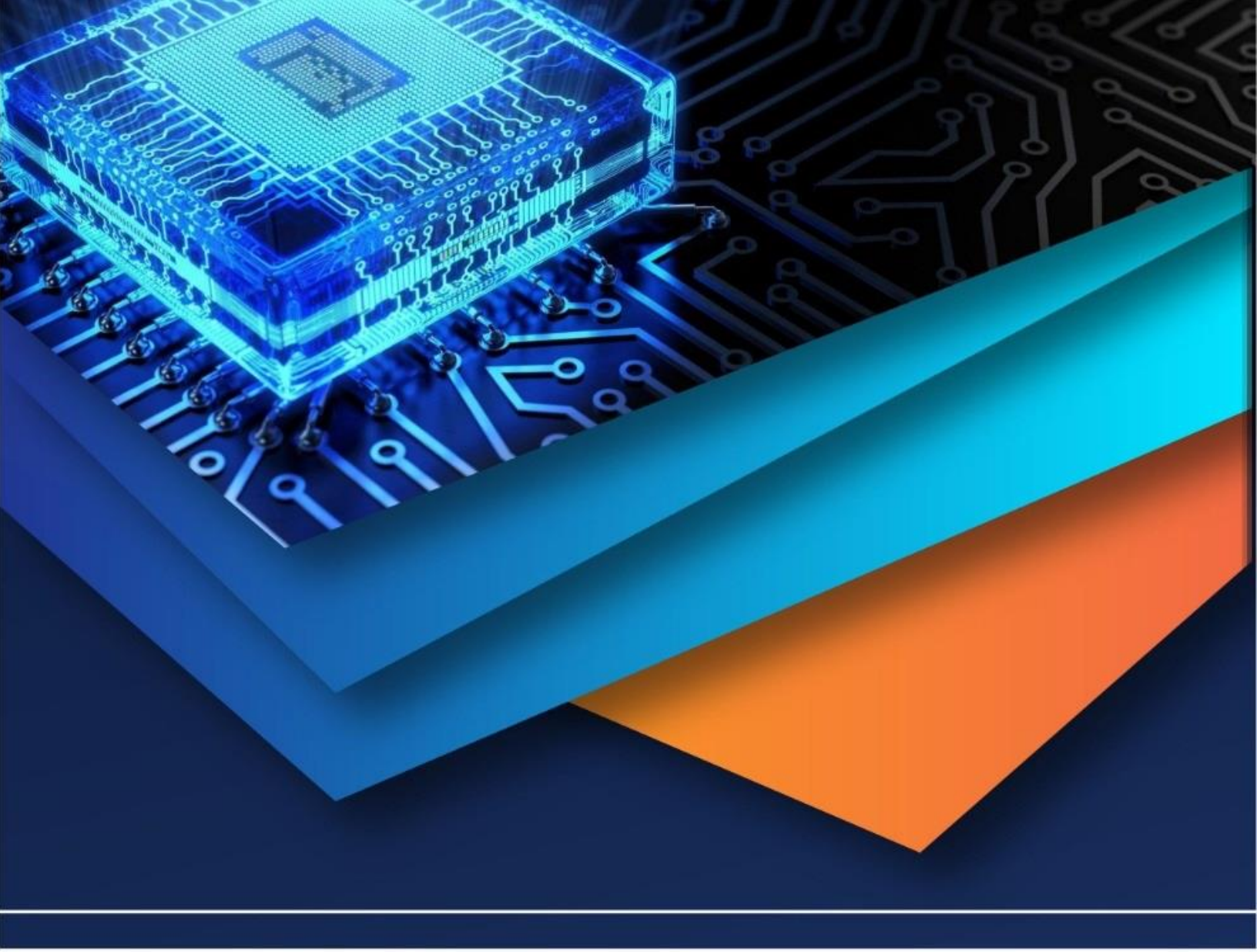

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