Automation in Agriculture using AGROBOT

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***Abstract*— AGROBOT stands for Agricultural Robotics. In the agricultural sector, there are many activities such as ploughing, sowing seeds, spreading water to plants, cultivating crops, spraying medicine on plants, and cutting off plants. As a result, we use an innovative approach to create these multipurpose tasks. AGROBOT is a vehicle that can be powered using an Android smart phone over the internet. The entire process resembles processing; monitoring is accomplished using sensors and motors controlled by a microcontroller. These days, technology advances at a breakneck rate. As a result, we can update and move forward with growth.**

Traditional farming methods were used in the past, and these methods included domestic animals such as cows. Some villagers still practise traditional farming methods today. However, traditional farming productivity is low, and as the world's population grows, we will need more productivity and food production, necessitating the development of new methods to improve the quality and efficiency of agriculture. Agriculture robotics is a modern form of farming in the fields of agriculture. We can solve all of these issues by implementing robotics in farmland.

Keywords*— *Intensive farming, Agrobot, Biodiversity, Agribusiness, Arable, Multi cropping, Cash crop.

I. INTRODUCTION

Agriculture is the practice of cultivating soil in order to grow crops and a variety of other things. India is known as the land of farmers because most of the country's citizens are directly or indirectly involved in agriculture production. Agriculture has fewer companions than other fields. Human controls, as well as natural calamities, have wreaked havoc on the world's changing agricultural and farming processes. Changes in the climate have a greater impact on agriculture production, which is growing while agriculture is deteriorating. At the same time, agriculture technology is evolving, with the aid of automation in the field, to alleviate the difficulties faced by farmers. The use of robotics in agriculture, such as ploughing, seed dispersing, and harvesting, will bring a move forward in our conventional life style method. This, in turn, gives better results in terms of productivity by increasing the rate of productivity.

In India, the traditional method of dragging, lifting, weed control, and fruit picking relies on manual labor. Farmers are currently not having better results due to the lack of use of robots in agricultural operations. These methods must be instilled in farming. Farmers are subjected to adverse environmental conditions when spraying chemicals and pesticides in agriculture. Tractors compact the soil in the fields because they are strong, caged, and unable to move in difficult terrain.

Fig. 1. Agrobot working in agriculture field [4]

This robotics will solve a lot of issues in the land. Robots can operate in any condition, regardless of the weather, according to a program that instructs them to perform the necessary exercise with the aid of computerization. The main benefit of the robots is that they are light in weight and do not compact the soil in the field.

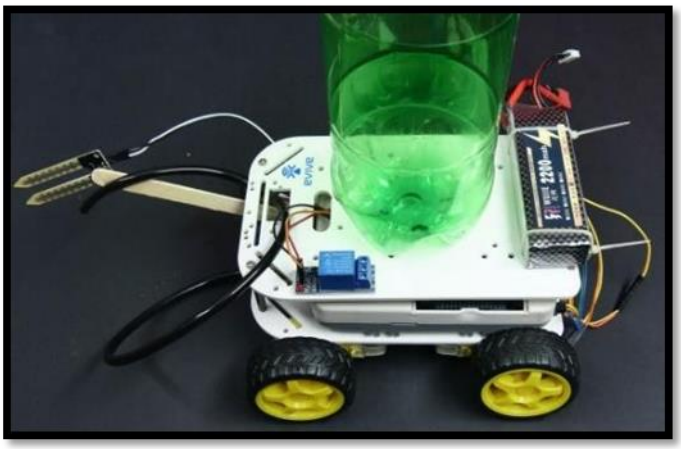

Fig. 2. Demo model of Agrobot [5]

II. LITERATURE SURVEY

[1]. The authors have proposed an Agrobot machine, which is designed to perform all farming processes on its own while using minimal manpower and increasing productivity. The key benefit of using this self-driving farming robot is that it not only increases productivity but also monitors environmental conditions such as temperature, soil moisture, and so on. This approach to creating the robot (the smarter machine) would shift traditional farming practices and usher agriculture into a new era.

[2]. the authors used two applications to demonstrate the operation of the robot that will perform real-time crop harvesting and fertilizing. Other accessories include slaves that perform various tasks. The aim now is to create smarter machines that are capable of operating in a natural or semi-natural world.

[3]. the authors have suggested a system that can carry out all agricultural tasks. They used solar energy, which is more convenient than other forms of renewable energy.

III. INTERNET of THINGS (IoT)

The internet of things (IoT) is a network of devices and systems that are embedded with sensors, software, and other technologies for the purpose of communicating and sharing data with other devices and systems through the internet. Because of the integration of various technologies, such as real-time analytics, machine learning, commodity sensors, and embedded systems, things have changed.

IoT technology is most often associated with smart home items, such as devices and appliances. Thermostats, home monitoring systems, cameras, and other home appliances that are part of an ecosystem and can be powered by a device that is part of that ecosystem, such as a mobile phone or smart speaker. IoT may also be applied to the health-care sector, agriculture, and other fields.

IV. AGROBOT

AGROBOT has three modes.

Mode 1: This mode is focused on burying the seeds in the ground.

Mode 2: This mode revolves around harvesting crops.

Mode 3: This mode is based on the ploughing of a robot.

Mode 1: In this mode, we'll look at how to dispose of seeds in soil while keeping an eye on obstacles. We must use RPM and DC Motor in this mode. A DC motor with a high RPM is attached to the robot's back, where the dispenser is located. The Arduino programming has set the dispenser to vibrate at a certain time. This regulates the flow rate and eliminates waste.

Mode 2: In this mode, we must keep an eye on the crop harvesting. Harvesting consists of cylindrical rods that harvest and collect the crops when they are harvested. The harvester is connected to an RPM DC Motor, and the speed and other characteristics can be managed using the code software.

Mode 3: We must see the Robot through the plough in this mode. A plough is made up of jagged teeth attached to the back of a robot that ploughs the field, allowing the seeds to settle in the soil in a straight line.

V. DESIGN MODEL OF AGROBOT

1. The front portion of the Agrobot is used for harvesting. The cutter is driven by a dc motor with a higher RPM, and it is made of Sun board and Iron sheet.
2. We used the digging mechanism in the back part of the end frame, where an iron nail teeth-like structure is used for digging and can be used as a robotic arm.
3. Seeds are sowing or dropped in the fields using the cylindrical structure. The seed are in flow in the fields through the cylindrical shape structure, drilled the hole on the shaft to digging dirt. This is made of acrylic sheet and connected to the dc motor.
4. A circuit has been constructed using the pcb board to connect all of the components and control the entire agricultural operation. The key part we use is a microcontroller called an ATmega328p, which is also known as an ARDUINO. The circuit includes a DC MOTOR that can drive two DC motors at the same time, as well as a power supply circuit that includes a voltage regulator to regulate power from 5 to 12 volts and solar panels to power the Agrobot.
5. The Arduino Uno is a microcontroller that we used to perform multitasking with logical programming.
6. For irrigation, we used a different sprinkler system. It connects to a humidity sensor that senses soil moisture.

VI. SOFTWARE DESCRIPTION

ARDUINO was the software we used for Agrobot. Arduino is an open-source software platform that consists of a single microcontroller board that links various types of devices. The Arduino software is used to programe the Arduino board, which is used to suggest a robot. A serial monitor and a serial plotter may be used to display the data.

VII. IMPLEMENTATION AND WORKING

1. We used combined functions in it to perform simple agriculture tasks such as ploughing, seeding, harvesting, and irrigation facilities (watering) while using the robot in farm land. When the robot moves, it begins ploughing and seeding, and when the robot stops, ploughing and seeding stops as well.

2. When the robot stops then it would start the sprinkling the water in the land

3. The working (or) movement of robot is controlled by the DC motors and switching software like Arduino.

The steps of the implementation are:

1. Enter the length
2. Enter the width
3. Select the mode
4. Microcontroller inputs
5. Algorithm executed
6. Rest once the execution is completed

The farmers give the dimensions of area or field as an input the total travelling area of robot is fixed.
Once we enter the dimensions, robot start working in the field once the robot reaches at the end then it turns to 1800 degree and start working by using Arduino, dimensions are taken or entered directly, after entering the dimension, then it asks the modes and work accordingly.

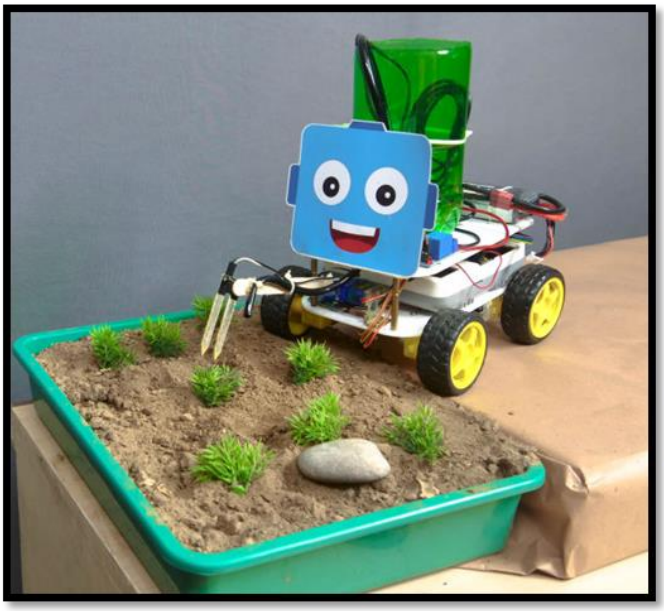

Fig. 3. Smart phone controlled Agricultural Robot for automatic irrigation system [6]

BENEFITS

Some benefits helpful to farmers:

- The cost is cheap and it is affordable to all farmers.
- It helps to all classes of people especially to helps poor people as well as middle class people.
- It is fully autonomous.
- Farmers are not need to present in farm land
- It runs through battery so it not harms the farm land.
- It works faster than the human's efforts and save time.
- It is fully an automatic robot which works on open architecture, does a lot of work in farms it reduces human labor
- The systems observe the different environmental conditions and takes accordingly which human can't do accurately.

USES OF AGRICULTURAL ROBOT'S

- Nursery planting
- Crop seeding
- Crop monitoring and analysis
- Fertilizing and irrigation
- Crop weeding and spraying
- Autonomous tractors
- Thinning and pruning
- Picking and harvesting

VIII. CONCLUSION

AGROBOT was made keeping in mind of the poor and uneducated farmers and it is specially designed to ease the work of the farmers so that food demand can be made easily. Results of agriculture robots serves better than the manual system. This is mainly based on the minimizing the man power and cost of the equipment, which can be affordable to all the farmers.

The AGROBOT monitors and thus provides warning to the farmers about the nutrients, soil moisture content through given mobile number the method proposed also sows seeds and the maintain the enough spacing and it also reduces the manual labor requirement by the help of this robots we can shape the internet of young generation in farming are which is very important for the development of the country Robots can be created as per the requirement of farmers in turn which produces high productivity. Development of prediction driven imagination activities of the agricultural robots from the future scope. Robots are designed for the improvement in the life.

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