International Journal for Modern Trends in Science and Technology, 9(05): 445-450, 2023

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/IJMTST0905075
Available online at: http://www.ijmtst.com/vol9issue05.html

IoT Based Smart Farming Robot for Agriculture

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To Cite this Article
Dr. J. S. Prasath, Ch. Rohitha, S. Pravallika, P. Thahseen and R. Vanitha. IoT Based Smart Farming Robot for Agriculture. International Journal for Modern Trends in Science and Technology 2023, 9(05), pp. 445-450. https://doi.org/10.46501/IJMTST0905075

Article Info
Received: 16 April 2023; Accepted: 10 May 2023; Published: 18 May 2023.

ABSTRACT

Majority of people income depends on the agriculture in India. In the recent years, due to increase in labor shortage, interest has grown for the development of the autonomous vehicles like robots in the agriculture. In this paper the system is the design of multi-purpose autonomous agricultural robotic vehicle which can be controlled through IoT and also with Bluetooth for seeding and spraying of pesticides which includes ploughing and smoothing mechanisms. A robot called agribot have been designed for agricultural purposes. The benefit of this proposed work is to minimize the labor of farmers and increases the speed and accuracy of the work. It performs the elementary functions involved in farming i.e., spraying of pesticide, sowing of seeds, and so on. Spraying pesticides especially important for the workers in the area of potentially harmful for the safety and health of the workers. This is especially important for the workers in the area of potentially harmful for the safety and health of the workers. These robots are used to reduce human intervention, ensuring high yield and efficient utilization of resources.

KEYWORDS: IoT, Bluetooth, Seed Sowing, Spraying Pesticides, Ultrasonic sensor

1.INTRODUCTION

Agricultural field is developing rapidly and the recent technologies such as IoT, robotics are utilised for agricultural operations. Agriculture is the essential for human being to live and it contributes major role for the source of income to the country. Automation gained lot of attention in all applications and it performs efficient and accurate especially complicated tasks and increase the rate of production. Now-a-days, more demands and insufficient agricultural labours all over the world. Agriculture robots are very much useful for farmers to monitor and maintain the growth of plants. The production rate of crop reduced by approximately more than 200 crores in a year due to lack of labours in the United States. Modern technologies such as IoT, robots, drones are essential to overcome the shortage of labours. The conventional methods of agricultural works are still used by many farmers which leads to less quantity of food items produced. The drawback in the conventional method of farming is the requirement of huge manpower, high wages to the labour, need continuous monitoring of crop conditions, need to supply the water to the plants whenever required and low profit. It is essential to create awareness among farmers about latest technologies and it usages in agricultural field. Modern technologies for agriculture overcome the drawback of the conventional methods of farming. The entire agricultural operations can be automated and the continuous monitoring of crops can be achieved through IoT. Robotic systems can be used to perform various agricultural operations including spraying of water and pesticides, ploughing, sowing of seeds, monitoring the

growth of crops and maintenance of plants in a daily manner. Smart agriculture is the recent trends and modern technologies are utilised in most of the agricultural operations.

2. LITERATURE SURVEY

The progress in the invention of agricultureal field has been developed into most challenging task especially because of increasing demand on the standard of agricultural projects and human unavailability in rural agricultural areas. Agribot is the most logical procreation of autonomous technology into green-house systems such as agricultural fields, forest areas, horticulture agriculture etc. with this machine we can able to increase accuracy and precision of agriculture. The modern system is proposed that identifies malware in IoT networks used in agriculture [1].

The essential features are chosen using recursive feature elimination, then converted into square colour images. The IoT based parallel and distributed simulation technique is proposed for pest management and agricultural monitoring tools [2].

The four levels of control is performed including crop management, pest identification and control, output activities, and input functional areas are distributed among them. The cost-effective mobile surveillance robot based on Raspberry PI is proposed which can be combined into any industrial area [3].

In this paper, a system will be acquainted through which it is possible to manage an indoor farm automatically at a very low cost. It is possible to supply water to the farm plants when required. It provides specific light to each plant for photosynthesis, which contains the concentration of CO_2 on the farm, which is suitable for the plants, etc. In addition, the whole arrangement can be managed from any location through the mobile app. This system comprises an ancillary robot that provides fertilizer to the farm's plants and real-time monitoring of the entire farm. The robot permits the user to define its task in advance or users can give instructions from any place at any time by using the app. [4]

Robots designed for agriculture performs various functions involved in farming such as plowing of land, seeding, watering, fertilizing, cutting of plants. This proposed machine can able to perform all the above operations, which reduces the efforts of farmers [5].

This paper confers a study of weather station and mobile data logging type monitoring. . In the 1800s, they had grain elevators, mechanized plougher, chemical fertilizers, and primitive gas-powered tractor. Then in the 1900s end, farmers began the use of satellites to plan various tasks in farmland. IoT is about to drive into the future generation of farming to become a successful benchmark. Several applications of IoT are present for use in agriculture and farming purposes. Uses of" Internet of Things farming" will assist the agriculture sector in future to develop and do the production much more efficiently. This paper gives information regarding multimedia devices, communication protocol, sensors and systems, which are largely used to monitor smart farming and specific algorithms used for such purpose. This paper will also help future researchers and provide them guidelines to follow in growing automated Smart IoT based monitoring. To meet the needs of large growing population by year 2050, the productivity needs to be increased by 25%. This goal can be achieved by the efficient use of advancements in robotics and automation [6].

The automated data logging and farming system is proposed to achieve efficient, water-conserving farming process. It combines sensors and automation that introduce efficiency and convenience to a scalable system that will help not only the government and the industries, but also individuals who are interested in farming or simply want to have quick and inexpensive access to fresh crops. This project introduces the conspicuous solution, which is an automated, data logging farming system, to achieve efficient, water-conserving farming process. This project combines sensors and automation that introduce efficiency and convenience to a scalable system that will help not only the government and the industries, but also individuals who are interested in farming or simply want to have quick and inexpensive access to fresh crops [7].

3. EXISTING METHOD

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.). So, it's a time to automate the sector to overcome this problem which in turn will also eliminate the requirement of Labors and also human power. The existing system is Farming Robot using Bluetooth, RF Module and by using man power. Operating the Agribot using Bluetooth and RF technology only for fewer distances. The existing agricultural operations performed manually. Due to this manual operation more number of labors are required, wages increases and less accuracy.

4. PROPOSED METHOD

The proposed system consists of robot which can carry out various farming activities simultaneously. In this project we are using Arduino Uno as Microcontroller, Ultrasonic sensor, and DC motors. Seed Hopper and Water Tank are used for seed sowing and pesticides spray operations respectively. The obstacle is to detect and send this information through Bluetooth and IoT technology. The objective of this work is to design the multipurpose autonomous agricultural robotic vehicle which can be monitored and controlled through microcontroller with IoT and Bluetooth for seeding, spraying of pesticides, obstacle detection, ploughing and smoothing mechanism.

An ultrasonic sensor is used to detect obstacle. If any obstacle is detected, the robot will stop and only after the removal of obstacle, robot will resume to work. The objective of this work is to design the multipurpose autonomous agricultural robotic vehicle which can be monitored and controlled through microcontroller with IoT and Bluetooth for seeding, spraying of pesticides, obstacle detection, ploughing and smoothing mechanism. These robots are used to reduce human intervention, ensuring high yield and efficient utilization of resources.

METHODOLOGY

The robot is placed in the farm and is switched on through IoT and its direction controlled by web browser or through the android application (by using Mobile phone). This starts the rotation of wheels by using DC motors and thus starts spraying pesticides, seeding which is done simultaneously as the robot moves forward. As the spiked wheels are in the front, a container is used for holding the seeds and the dropping of seeds by some periodic delay and can be done using servo motor. The final step is spraying of pesticides which can be done with the help of solenoid valve and is periodically spraying and ploughing and smoothing are the mechanisms.

The multi-purpose agricultural Robot is used to control the functions like ploughing the soil, seed sowing, and pesticide/water spraying and controlled through Wi-Fi module with low budget and the total system can be controlled by both IoT and Bluetooth by using a mode switch which switches either for IoT or for Bluetooth. The block diagram of the system is shown in Figure.

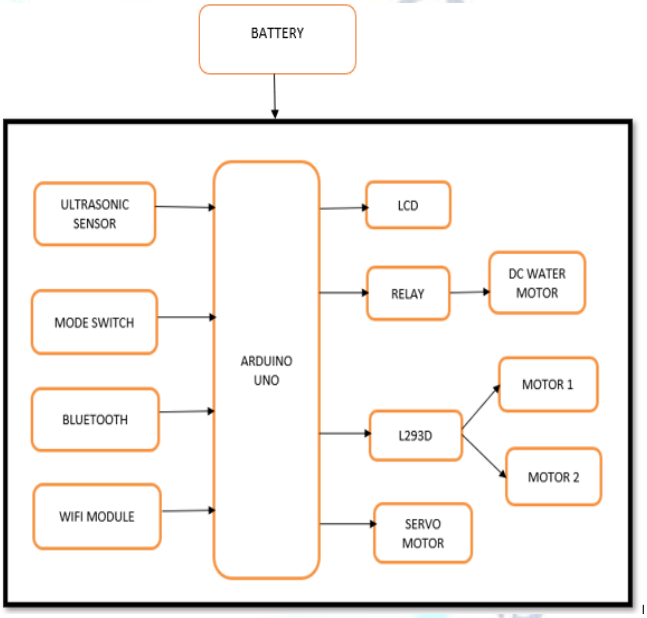

Figure.1. Block Diagram of the Proposed IoT Based Farming Agribot

5. RESULTS AND DISCUSSION

The output of the work done by using both IoT mode and the Bluetooth mode.

OUTPUT OF BLUETOOTH MODE

In Bluetooth mode we control the Agribot using Arduino Bluetooth Control app. In that app we gave instructions for the movement of the robot. Instructions for the robot are one for forward movement, two for the Backward movement, three for the left movement, four for the right movement, six and seven for the pest-on and pest-off for the pesticides spraying and finally five for to stop the Agribot.

With the help of the instructions, the agribot moves

according to the direction. Agribot moves forward, backward, left, right. Agribot simultaneously performs all these operations. Pest-on, pest-off conditions also works simultaneously in the agribot along with remaining operations.

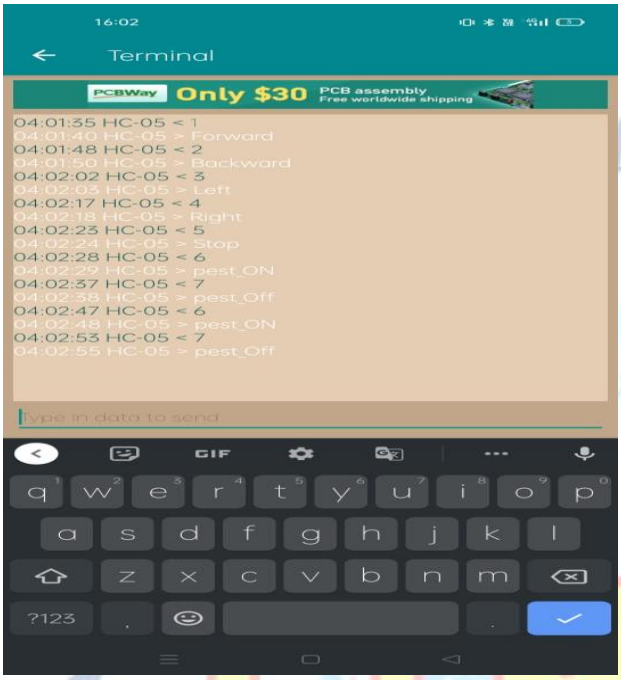

Figure.2. Instructions in the Bluetooth app to control Agribot in Bluetooth Mode

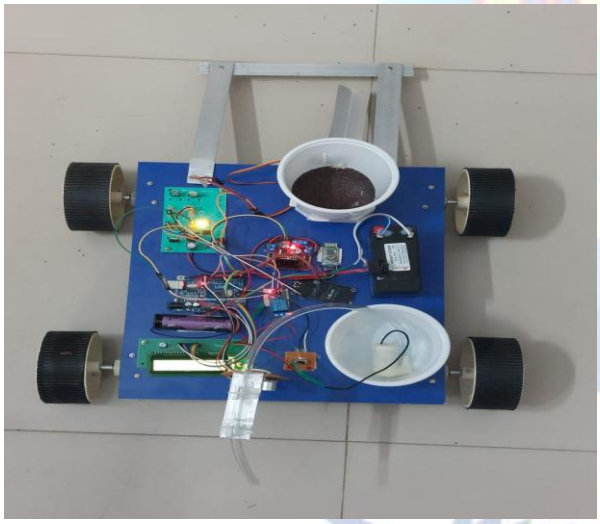

Figure.3. Bluetooth Controlled Agribot

OUTPUT OF THE IoT MODE

In the IoT mode we control the Agribot by using a Web page. Web page is created by using HTML, CSS, JavaScript etc. By using this web page, we gave the instructions for the movement of the Agribot. If we want to move the Agribot forward we already created an FWD button for forward movement BWD for the backward movement when we click the button on the web page the Agribot move according to the instruction. In this IoT mode, Ultrasonic sensor is used to detect the obstacles when the obstacle is found the robot will stop and after we remove the obstacle the agribot will start again based on the previous Instruction. This is the main difference that the agribot operated in IoT mode and the Bluetooth Mode.

Figure.4.Webpage to control Agribot in IoT Mode

By using Arduino IDE software, we are giving instructions to the agribot. We dumped the code in Arduino UNO. For both IoT and Bluetooth mode we used different codes. From the below figures represents how an agribot is working under the instructions. Agribot moves according to the instructions in both Bluetooth mode and IoT mode. In IoT mode we control all the operations simultaneously by using an webpage. Our project main focuses how an agribot work on IoT mode but we add Bluetooth mode to show the difference how it works on both the modes.

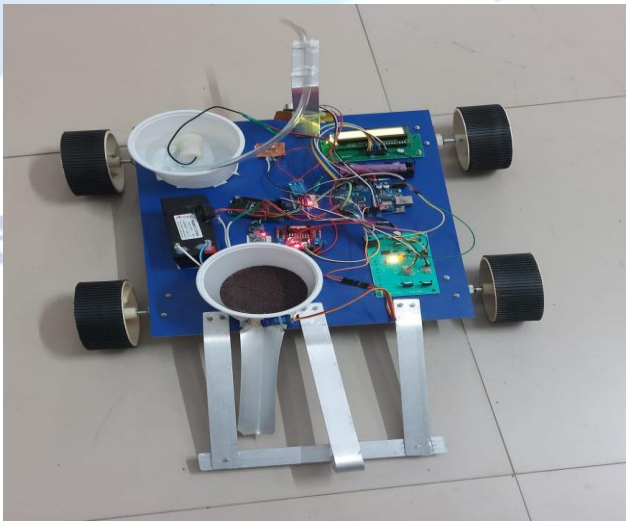

Figure.5. IoT Controlled Agribot

6. CONCLUSION

An autonomous multipurpose agricultural robot is designed to perform the complex farming tasks like seed sowing, pesticide spraying, ploughing, cutting etc. This work is designed to perform seed sowing, pesticide spraying, Obstacle detection using Ultrasonic sensor and ploughing, smoothing are mechanisms The benefits of robot are reduced human intervention and efficient resources utilization. Instructions are passed to the system using Bluetooth and IoT which ensures no direct contact with human and thus safety of operator is ensured. In Bluetooth mode the operations are performed using android Bluetooth app and In IoT mode the operations are performed by using an Web page. Innovative seed sowing, and pesticide sprayer equipment has significant influence in agriculture. By using this advanced work, farmer can save more time and also reduce lot of labor cost.

7. FUTURE WORK

Since the designed agribot is used for sowing of seeds, spraying of pesticides, Obstacle detection controlled through internet of the thing and also through Bluetooth mode. The following features can be added for enhancing the current project work: pH meter can be in order to determine the pH of the soil which helps to identify the suitable pesticide/fertilizer to be employed Moisture level sensor can be employed to know about the moisture content present in the soil of the farmland and also we can add the feature which monitor the plant using Image processing, We can add solar system to the entire project which also help farmers in summer days.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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