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IOT & SOLAR ENERGY BASED MULTIPURPOSE AGRICULTURAL ROBOT FOR SMART FARMING

[1]Mr.S.Srikanth, [2]S.Manisha, [3]V.Sreeteja, [4]V.Vishruthi

[1]Assistant Professor, Department of Electronics And Communication Engineering, Malla Reddy Engineering College For Women, Hyderabad.

[2,3 &4]Ug Scholar, Department of Electronics And Communication Engineering, Malla Reddy Engineering College For Women, Hyderabad

ABSTRACT

In India, nearly 70% of people depend on agriculture. In the agricultural field, various operations such as seed sowing, grass cutting, pesticide spraying, ploughing are carried out. Automation of agricultural operations is a current demand to increase productivity through the use of tools and technology. At the moment seed sowing, pesticide spraying, and grass cutting are all difficult tasks. The equipment needed for the aforementioned actions is both expensive and inconvenient to use. As a result, India's agricultural system should be advanced through the development of a system that reduces reliance on human labour and time. The proposed agricultural robot is a user-friendly, Internet of Things (IoT)-based system that can be used in any type of soil. Users can use a web page to monitor the crop's condition as well as perform some specific operations. The objective of this project is to design, develop, and build a robot that can sow seeds, cut grass, spray pesticides, pluck fruit, and detect soil nutrition levels and irrigation. Solar energy is used to power the entire system. By connecting through wireless modules. the designed model can be controlled via a web page. The web page is used to control the robot's required mechanism and movement. This improves the efficiency of seed sowing, pesticide spraying, grass cutting, fruit plucking, soil nutrition level detection, and irrigation, as well as reducing the need for manual planting.

I. INTRODUCTION

Majority of the Indian people occupation is agriculture. Agriculture in India dates back to the Indus Valley Civilization Era, and possibly even earlier in some parts of Southern India. India provides second largest output in agricultural field. Indian agriculture is struggling with issues such as availability of skilled laborers, lack of water resources, rising labour costs and crop monitoring. In agriculture, automation technologies are used to solve these issues. Automation in agriculture helps farmers to reduce their efforts and increases the yield, which in turn increases the net profit. The vehicles are being developed independently for the processes such as ploughing, leveling, and water spraying. Developing a single machine that can do all these mechanism will help out farmers. In this project, a Robot is developed an efficient way to perform the functions autonomously. The proposed plan is to implement the Robot to perform the functions such as ploughing, seed sowing, soil leveling, and water spraying along with that soil nutrition level detection, fruit plucking and irrigation is also performed through web page. Some related works carried so far is described below. In [1],

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the robot is powered by a solar panel and controlled by a Bluetooth / Android app, which sends signals to the robot to control the necessary mechanisms and movements. Sunlight is converted to electricity and fed into the charging circuit when the solar panel is heated. The HC-05 Bluetooth module is used to send and receive signals from the microcontroller. The app sends signals to the robot, which waits for the appropriate processes to be activated when the signal is received. The automatic spraying device consist of single spray nozzle with an automatically adjustable spraying angle, color camera, and distance sensors, all organized on a pan tilt unit is given in [2]. This aims to spray the pesticide on particular area or target which in turn reduces the wastage of pesticides. The spraying nozzle parameters are set using the size of the object. The main objective is to change the angular position of nozzle according to object which can be achieved by using color camera and distance sensors. In [3], describes a method for detecting nitrogen (N) deficiency in corn fields. Drone collects the images of corn field and RGB sensors detect hardness of the field. A highaltitude flight has covered the entire field and identified potential areas where the plants may deficient of nitrogen. In the field of RS, pixel coloration is the method used to detect generic stressed area, such as the normalized difference vegetation index (NDVI), are widely used, with commercial solutions readily available. The GPS coordinates of those areas are sent as way points to a small-scale UAV for an automated low-altitude flight. The design of cost efficient soil nutrients detection using pre-prepared capsules is depicted [4], shows the design of a cost-effective soil nutrient detecting system using pre-repaired capsules. Three different types of nutrients such as Sodium, Potassium and Phosphorous can be tested. The color sensor is employed, and the sensor detects the color change in the test tubes and compares with existing information on color deficiency. Sensor data is analyzed with Arduino and the farmer is provided information about the shortfall and the amount of fertilizer required to correct it. The color of the soil sample is determined using a TCS3200 color sensor. The system in [6], aims to develop a multipurpose autonomous agricultural robotic vehicle for ploughing, sowing, and irrigation that can be controlled via Bluetooth. A multipurpose agricultural robot is used to control three functions: Ploughing, seed planting, and leveling the land to prevent mud and water spraying with the fewest changes in accessories and at the lowest possible cost. Ploughing, sowing, leveling, and water spraying are among the operations provided by the system. The farm is ploughed with the assistance of a DC motor and a screw rod. As the cultivator turns, the nut welded to it glides between the screws of the screw rod. After that, the cultivator is lowered to some height, and dirt is dug up to a 1.5-inch depth. The cultivator’s direction can be controlled using a Bluetooth app on a smart phone. In [7], the monitoring and control of the field using IoT is discussed. This allows the field’s condition to be monitored from anywhere in the world via the Internet. Two different control systems have been created. The first is field control, while the second is robot control. Sensor data is shared with the farmer via the Android app in field control. In pest control, the robot sprays pesticides to keep pests at bay. Sensors are placed in a fixed location in this scenario. The fixed location of sensor will not allow estimate the whole field.

II. LITERATURE SURVEY

B. Ranjitha, M. N. Nikhitha, K. Aruna, Afreen and B. T. V. Murthy, "Solar powered autonomous multipurpose agricultural robot using Bluetooth /android App," in IEEE 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA), pp. 872- 877, 2019, doi: 10.1109/ICECA.2019.8821919.

In India nearly about 70 percentage of people are depending on agriculture. Numerous operations are performed in the agricultural field like seed sowing, grass cutting, ploughing etc. The present methods of seed sowing, pesticide spraying and grass cutting are difficult. The equipment's used for above actions are expensive and inconvenient to handle. So the agricultural system in India should be encouraged by developing a system which will reduce the man power and time. This work aims to design, develop and design of the robot which can sow the seeds, cut the grass and spray the pesticides, this whole system is powered by solar energy. The designed robot gets energy from solar panel and is operated using Bluetooth/Android App which sends the signals to the robot for required mechanisms and movement of the robot. This increases the efficiency of seed sowing, pesticide spraying and grass cutting and also reduces the problem encountered in manual planting. Agriculture's history dates back thousands of years, and its development was driven and defined by very different climates, cultures and technologies. So the agriculture system should be advanced to reduce the efforts of the farmers. The model developed automatically sows the seeds, spray the pesticides and also cut the grass. The prototype represents the advanced system for improving the agricultural processes such as seed sowing, grass cutting and pesticide spraying based on robotic assistance. The organization of the paper is as follows. Section II presents previously published related works. The proposed design of multipurpose agricultural robot is presented in Section III. The algorithm implementation is discussed in Section IV. In Section V prototype results of the work are discussed. In Section VI work is concluded.

III. EXISTING SYSTEM

1.In [1], the robot is powered by a solar panel and controlled by a Bluetooth / Android app, which sends signals to the robot to control the necessary mechanisms and movements. Sunlight is converted to electricity and fed into the charging circuit when the solar panel is heated. The HC-05 Bluetooth module is used to send and receive signals from the microcontroller. The app sends signals to the robot, which waits for the appropriate processes to be activated when the signal is received**.**

2. In [3], describes a method for detecting nitrogen (N) deficiency in corn fields. Drone collects the images of corn field and RGB sensors detect hardness of the field. A highaltitude flight has covered the entire field and identified potential areas where the plants may deficient of nitrogen. In the field of RS, pixel coloration is the method used to detect generic stressed area, such as the normalized difference vegetation index (NDVI), are widely used, with commercial solutions readily available. The GPS coordinates of those areas are sent as way points to a small-scale UAV for an automated low-altitude flight

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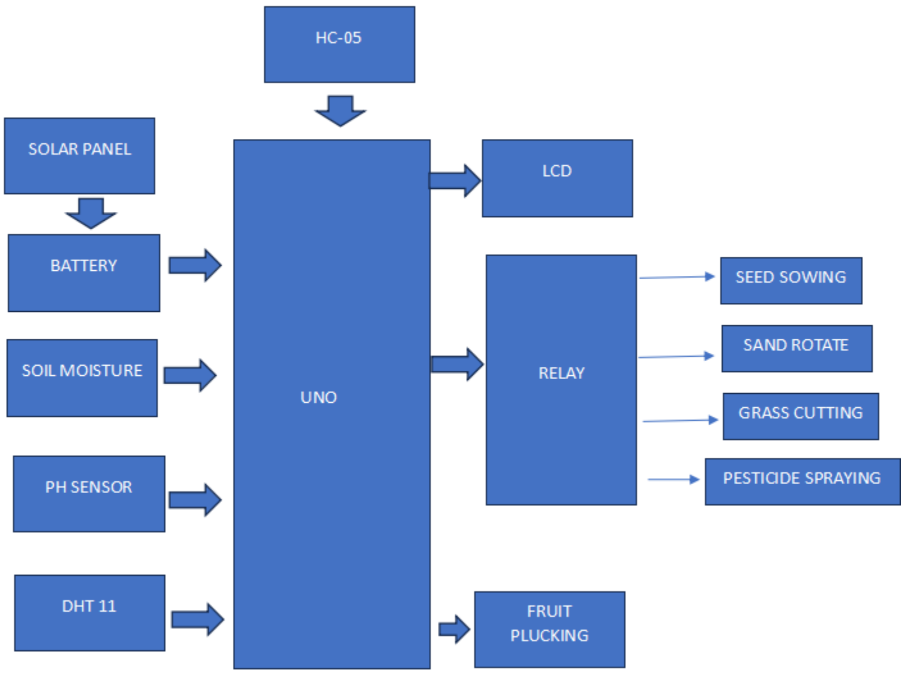
IV. PROPOSED SYSTEM

Smart Agriculture robot is built which can be controlled through IoT described in [15], which will perform different operations like seed sowing, pesticide spraying and measuring soil parameters. Robot can move in any direction soil monitoring parameters like humidity, luminosity and soil moisture. Sensor continuously updated into blynk app. In seed sowing operation the user is able to measure the size of the seed in all bins and sow the seed at different path and space according to size of the seed. In [16], Multipurpose agro system is proposed for different type of work that require man power. This robot performs multiple tasks like spraying medicines, seed sowing and watering plants. And also explains how to increase yields using latest technology to meet the current increasing demands of country. Many research gaps relating to Agriculture robots have been explored based on the previously published articles [17- 19]. Other research gaps could also be found such as live video broadcasting of agricultural fields and detecting soil nutrition levels. Ploughing, seed sowing, grass cutting, fruit plucking and pesticide spraying are all displayed indecently. However none of the systems have incorporated in all tasks. The goal of this project is to combine all operations into single robot and develop a versatile robot that must be efficient and effective.

Block diagram



V.CONCLUSION

A user-friendly agriculture robot can be designed and controlled remotely using IoT and automation technology. Perform the multiple tasks at the same time to reduce manual work and increase yield and profit. Soil nutrient detection entails providing the farmer with complete information on the crop’s nutrient requirements. Solar power will be effectively used which is advantage for formers in areas where electricity is not sufficiently available.

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VI.REFERENCES

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