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Intelligent Farming Robot

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Abstract-The purpose of this paper is to demonstrate how traditional agriculture can be transformed into smart agriculture by using a smart device that is outfitted with sophisticated updated technologies, enabling it to carry out nearly all farming tasks quickly and easily and produce the anticipated results of high-quality work and increased productivity. The Arduino will be connected to a variety of sensors that are used to remotely operate the robot and set a timer for each task that it is intended to carry out. The goal of this project is to develop a smart gadget that will help farms become more productive, enhance crop quality overall, and make farming job safer and easier so that future generations will want to engage in it in agriculture and develop it. The little farm robot's design, implementation, and successful operation are the intended goals of this work. As it is anticipated that this robot, which is fitted with an accurate sensor, would be able to determine the separations between each seedling while the planting process is taking place. After programming the robot and connecting it to the computer, it should also be able to coordinate irrigation and fertilizing activities according to the needs of the plant using the data stored in the electronic chip. The desired outcomes of this project are the design, implementation, and successful operation of the mini farm robot. As it is expected that this robot, equipped with an accurate sensor, will be able to calculate the distances between each seedling and another during the planting period. It is also expected to have the ability to organize irrigation and fertilization operations according to the need of the plant, through the information stored in the electronic chip after programming the robot and connecting it to the computer.

Keywords- Robot, Sensors, Microcontroller, and Ultrasonic sensor etc.

I. INTRODUCTION

The state spends a lot of money on importing agricultural goods due to the continual growth in the population, the demand for more food, and the difficulties with the soil, the inadequate monitoring of the water and fertilizer needs of agricultural fields, and the economics of the state [1-5]. Additionally, these robots will help produce more high-quality food without the need for a sizable labor. The farmers' need to operate heavy machines will significantly decrease because of this agricultural growth [6-10].

Since the farmer can only plant a small area, the labor-intensive physical method of dispersing seeds is deemed an economic loss if the seeds end up somewhere other than their intended location. He will be able to seed effectively and keep setting spacing thanks to this initiative, which will speed up the process of plant growth compared to humans.

The purpose of the paper is to design a little farmer smart robot that has a variety of smart components so, it can help farmers execute their tasks on farms quickly, easily, and fixable while also boosting farm productivity [11-15].

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II. OBJECTIVES

The objective of this paper is listed below.

- To use timers to control some farming operations, such as watering and fertilizing the trees.
- To use an ultrasonic sensor to determine the proper spacing between each seedling.
- In contrast to previous farmer robots, this project's robot is built with a water tank and a fertilizer container.

It can be used on farms with substantial land areas that produce food for export and provide stores with fruits and vegetables. It might also be in greenhouses.

III. RELATED WORKS

This article examines robots' agricultural tasks, such as getting rid of weeds, discovering plants, and harvesting them, as well as developing sensors as a crucial component of intelligent agricultural robots. It also referred to a plan that entails studying and keeping track of the activities of a sizable number of tiny robots, who will then work with drones to advance agriculture [16-18].

This essay examines Pakistan's use of intelligent agricultural robots as a factor in the nation's economic stability [19-25]. It stated that agriculture should receive special attention due to the rising population and the growing need for food. From this perspective, the concept of tunnel cultivation employing computers and specific sensors arose [26-30].

The most significant recent developments in the field of agricultural artificial intelligence were summarized in this article, particularly those that were employed for autonomous weed management and field alpha surveys and data gathering. As many issues as possible are presented in the context of digital agriculture, including object recognition, algorithmic tasks, sensor processing, and optimization.

People highlight the idea of many robots, human-machine cooperation, and reconstruction of the surrounding environment from aerial photographs and ground sensors to build a virtual farm on several digital agriculture portals.

Most of the development of the agricultural robot is focused on the collection and removal of weeds that affect plants, therefore this article analyzes the development of the robot's smart operating systems. As a result, sensors must be used in the development of robots, and faster processing algorithms must be created [31-40].

There is numerous idea and innovation to robotize in farming as the robotization has a serious collaboration with artificial intelligence, data and correspondence innovation and sensor innovation. These innovations crash into the fourth insurgency industry. The mechanical cycles help the automatization in horticulture. The interest in food items is developing, the working power getting old, and these effects powers the robot applications. This article presents the robots in the agribusiness.

IV. DESIGN AND ANALYSIS

In this paper, the project's block diagrams, and the roles of each component are explained, along with a discussion of how they relate to one another. Additionally, a process flowchart listing the project implementation steps will be provided. Additionally, it will go into detail about the input and output of parameters taken from datasheets and used in the project.

V. SYSTEM BLOCK DIAGRAM

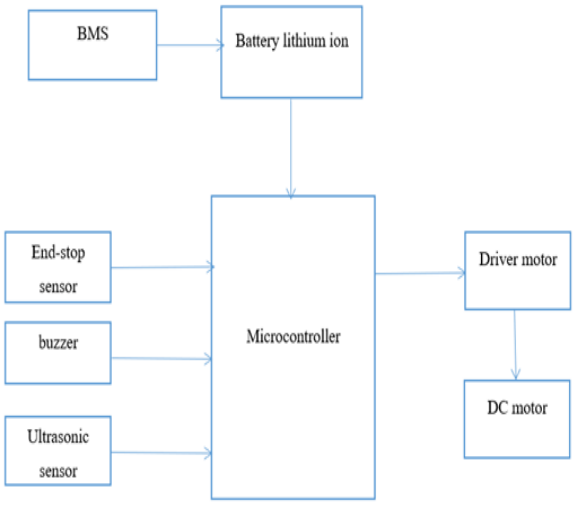

Fig 1. Block diagram of Intelligent Farming Robot.

The robot's movement and operation are controlled by a DC motor, gearboxes, and sensors. These

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components are connected to the Arduino so that commands or times may be specified for each action the robot will perform.

The system controls the robot to quickly complete the seedling and cropping tasks while also keeping an eye on all its connected activities. In the block diagram, DC motors are outputs, and all sensors are inputs. Arduino is regarded as the project's CPU, and it will read input before producing output.

VI. FLOWCHART

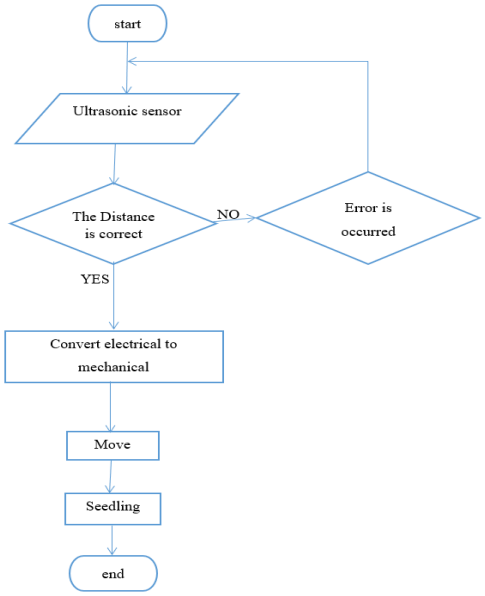

Fig 2. Flowchart of the proposed work.

Robotics system flowchart with the robot's operation beginning with ultrasonic, end-stop, and buzzer sensors. After programming Arduino, it must show the results.

VII. SYSTEM DESIGN

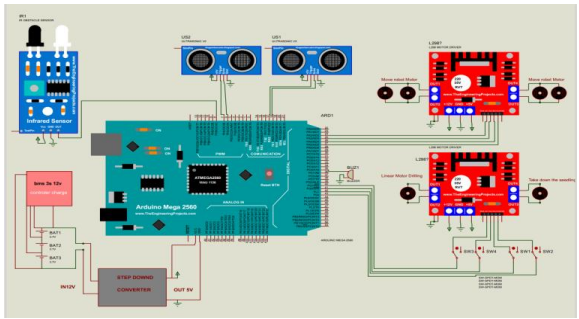

Fig 3. Circuit diagram connections.

The Arduino, which has 54 pins, is the primary component used in designing the project's system. After testing to ensure that all input sensors and the battery with BMS recharge are functional, the connection will begin. Two ultrasonic sensors that we have each contain four pins (GND, Echo, Trigger, and +5 V). With US1's 17 and 18 pins and US2's 6 and 7 pins, Echo and Trigger will be connected to the Arduino mega 2560.

Two pins are on the buzzer sensor (GND and another pin connect with pin 35 in Arduino). In an Arduino mega, the end-stop sensor has three pins (GND, Vcc, and OUT will connect to pin 8). The converter is connected to the BMS 3s before being connected to the Arduino's Vcc and GND pins. L289 motor drivers will connect to four of the Arduino's digital pins (40, 41, 42, and 43). The second will likewise be connected to four additional digital pins (24, 25, 26, 27). The robot will next be programmed to begin moving and doing the duties.

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