Smart Agriculture Robot Controlling using Bluetooth


Abstract — Agriculture is critical to the growth of an agricultural country. Agriculture-related issues have traditionally hampered the country’s progress. The only answer to this challenge is smart agriculture, which involves upgrading conventional agricultural processes. When the signal reaches the Arduino, it will send a command to the relay of that specific line field valve to activate it in order to open the valve, as well as a command to the relay of the pump to exchange it directly in order to irrigate that field. Also, if two or three of the three plants’ moisture sensors are operational, all three fields can be watered at the same time. As a result, all solenoid valve relays may be activated to open all valves, and the pump can operate to water all three plants. Choosing a proper pump to paint to water all flowers at the same time was an issue at first. The system's software has been set, and the system will no longer function unless (or three moisture sensors) are engaged. However, if one sensor of any line is engaged, the system will no longer function since that sensor may also be malfunctioning. If the water tank level is too low, the system will not function at all, even when all plant sensors are enabled to safeguard the water pump.

Keywords — Agriculture, Arduino Mega, Bluetooth Module, Fertilizer, Solar Panel.

I. INTRODUCTION

Irrigation is a critical component of economic development in any growing country. Irrigation specialists have used manual irrigation methods for many years. The manual approach has several limitations and is unreliable for large-scale irrigation. Irrigation has a direct influence on ultimate product cost and output. This technique seeks to eliminate the attractive 32 manual irrigation approach, which has to be enhanced over time. The aim was reached after finishing the plan and collecting the components of the smart irrigation system. In addition, all of the requirements were met in order to complete this smart irrigation system and bring it into full production and finalization. Following that, the system was tested, and the end result was as expected. The system will now not function until two or three moisture sensors from any of the three lines of the three fields send a signal to the Arduino indicating that the soil is dry, and the crop requires water. Farmers in the modern period utilize a manual irrigation technique in which they water the ground at regular intervals. This technique appears to use more water, resulting in water waste [1].

Nikesh Gondchawar and his colleagues want to use automation and IoT technology to make agriculture smarter. One of their project’s standout features is a smart GPS-based remote-controlled robot that can do duties like as weeding, spraying, moisture detection, bird and animal scaring, vigilance, and so on [2]. On their article, Pooja Mohan Moger and his team experimented with these technologies, which include weeding, turning on/off the water pump, frightening animals and birds, and detecting temperature, humidity, and wetness using suitable sensors [3]. Mahammad Shareef Mekala and his colleagues examined several common uses of Agriculture IoT Sensor Monitoring Network technologies that use Cloud computing as the backbone. This survey is intended to better understand the various technologies and to construct long-term smart agriculture [4]. Praveen Kumar Reddy Maddikunta and his team attempted to investigate the types of sensors suited for smart farming, as well as the possible requirements and problems for operating UAVs in smart agriculture. We’ve also discovered potential future applications for UAVs in smart farming [5]. The Smart Agriculture communication system based on the Internet of Things is a success for Atmaja and his team since all data from the sensor is successfully received by the Raspberry Pi and delivered to the database, which can be viewed via the built-in android application and website [6]. Anil Maragur and his colleagues created a vehicle that is driven by a DC motor driver through Bluetooth input. These robots have the benefit of requiring less manpower and labor, making them an efficient vehicle. While the aforementioned issues in mind, a system with the aforementioned features is built [7]. In this work, we insert a novelty that the system will not work until two or three moisture sensors from any of the three lines of the three fields send a signal to the Arduino signaling that the soil is dry, and the crop needs to be watered. When the signal reaches the Arduino, it sends commands to the line field valve’s relay to activate it in order to open the valve, as well as to the pump's relay to exchange it directly in order to irrigate that field. Also, if the moisture sensors on two or three of the three plants are working, all three fields can be irrigated.
at the same time. As a consequence, all solenoid valve relays may be actuated to open all valves, allowing the pump to water all of the plants.

The major goal of our work is to cultivate agricultural land, offer to ladder, fertilizing, and watering when the ground becomes wet, seeding automatically, and Robotic Car Controlling the Bluetooth Device [8]-[15].

II. METHODOLOGY

The Microcontroller is the brain of the system, as seen in this block diagram. It collects data and generates outputs in accordance with the program's instructions. We receive data from the Bluetooth module and moisture sensors to detect moisture, and if water is required for the land, the water pump is turned on; otherwise, the water pump is turned off. The Bluetooth module is also used to regulate the entire operation.

This project included four categories of work: Cultivate with relation to the land. The Land’s Ladder To determine the soil's moisture content. When the ground is dry, turn on the water pump automatically. When there is enough water in the ground, the sensor will automatically detach, and the water pump will turn off. Apply fertilizer to the land.

We began by presenting our project and its prospects. This chapter will go through Arduino Mega, Motor Driver, Motor, Servo Motor, Water Pump, Soil Moisture Sensor, Relay Module, Solar Panel, Buck Module, Boost Module, and Diode in more detail [16]-[20].

A. Soil Moisture Sensor

A moisture level in the soil is detected by an autonomous moisture detection and watering system. To properly regulate the moisture content of a plot of soil, the automatic moisture detecting, and the watering system can be used in conjunction with a typical automatic watering system. Because plants take water directly from the soil, the autonomous moisture detecting, and the watering system is designed to manage the moisture content of the soil by measuring moisture content inside the soil [23]-[25].

Fig. 1. Block diagram demonstrating the methods used.

Fig. 2. Circuit diagram of this work.
A photovoltaic module has been used in a solar panel, which uses light energy (photons) from the Sun to create electricity via the photovoltaic effect. The majority of modules employ wafer-based crystalline silicon cells or thin-film cells. A module's structural (load bearing) element might be either the top or bottom layer [26]. In addition, Fig. 2 showed the circuit diagram of this research work.

Hardware implementation of our work is given in Fig. 3. In Fig. 3, we can see a display, Bluetooth module, solar panel, and voltages meter. For commanding the farm robot, the Bluetooth module received a command from an Android phone. A voltmeter may also be used to measure solar voltage.

III. RESULTS AND DISCUSSION

In Fig. 4, we can see the boost module, servo motor, and relay module. The Bluetooth module got the order to operate the Servo Motor from the Android phone.

Fig. 5 shows a servo motor, a motor driver, and a soil moisture sensor. Soil moisture sensor detects soil moisture, Bluetooth module receives a command from an Android phone to drive a servo motor, and this project is run. Table I represents the cost-effectiveness of this work.

Bluetooth is used to control this project. Solar energy is used to power the system. We have a charge stored in a 12 V battery. When you have finished setting up the entire project, connect it to the Bluetooth module using Bluetooth RC Car Apps.

Our work has the advantages of being extremely easy to control, high dependability, having digital facilities, fast operation, and high efficiency. This mechanism operates in the presence of light. There are two conditions: if the light is above the needed value, moisture performs its function; if the light is below the required system, moisture does not do its function. This technique is designed for small projects such as mushroom farms and indoor farms; thus, if farmers try to use it on a large farm, certain errors may arise. This method does not get local weather, which determines when to irrigate a landscape.

### TABLE I: COST ANALYSIS DATA

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Components Name</th>
<th>Price in Taka</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Arduino Mega</td>
<td>1600/=</td>
</tr>
<tr>
<td>02</td>
<td>Motor+Mount+Hex+Wheel</td>
<td>3600/=</td>
</tr>
<tr>
<td>03</td>
<td>LCD 16*2</td>
<td>180/=</td>
</tr>
<tr>
<td>04</td>
<td>Voltmeter</td>
<td>120/=</td>
</tr>
<tr>
<td>05</td>
<td>Solar Panel</td>
<td>450/=</td>
</tr>
<tr>
<td>06</td>
<td>Battery</td>
<td>1100/=</td>
</tr>
<tr>
<td>07</td>
<td>Servo Motor</td>
<td>900/=</td>
</tr>
<tr>
<td>08</td>
<td>Bluetooth Module</td>
<td>350/=</td>
</tr>
<tr>
<td>09</td>
<td>Boost Module</td>
<td>120/=</td>
</tr>
<tr>
<td>10</td>
<td>Buck Module</td>
<td>120/=</td>
</tr>
<tr>
<td>11</td>
<td>Water Pump</td>
<td>160/=</td>
</tr>
<tr>
<td>12</td>
<td>Motor Driver</td>
<td>300/=</td>
</tr>
<tr>
<td>13</td>
<td>Relay Module</td>
<td>120/=</td>
</tr>
<tr>
<td>14</td>
<td>Soil Moisture Sensor</td>
<td>180/=</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>9300/=</strong></td>
</tr>
</tbody>
</table>

Fig. 3. Front Side View of this work.

Fig. 4. Left Side View of the project.

Fig. 5. Right Side View of the project.

Fig. 6. Project Picture of Bluetooth RC Car Apps.
IV. CONCLUSION

Irrigation is a critical component of economic development in underdeveloped nations such as Nepal. Irrigation specialists have used manual irrigation methods for many years. The manual approach has several limitations and is unreliable for large-scale irrigation. Irrigation has a direct influence on ultimate product cost and output. This approach tries to eliminate the allure of hand watering, which must be enhanced over time. The aim was reached after finishing the plan and collecting the components of the smart irrigation system. In addition, all of the requirements were met in order to complete this smart irrigation system and bring it into full production and finalization. Following that, the system was tested, and the end result was as expected. Farmers in the modern period utilize a manual irrigation technique in which they water the ground at regular intervals. This technique appears to use more water, resulting in water waste.

REFERENCES


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