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Smart Agro IoT Automation

Integrating IoT for Sustainable and Efficient Crop Production

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Abstract: The aim of the project is to provide a smart agriculture system that automates several stages of the production process, including field leveling, seed sowing, fertilization, and pest control. The goal is to minimize manual interventions, thereby increasing production accuracy and profitability for farmers. Automation in Agriculture can be easily achieved through the implementation of IoT (Internet of Things). IoT refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, where data is stored. Automated spray fertilization, seed sowing, and ploughing machines are connected to an IoT-based application, enabling easy control of these activities. For instance, automated irrigation, using smart sprinklers, helps farmers significantly reduce water consumption, making agriculture more sustainable. While individual processes are controlled through a Bluetooth module, the overall vehicle is managed through a Wi-Fi module. This integrated approach ensures higher standards of quality in harvests. Although the automation of these individual processes already exists, the innovative part of this project lies in integrating all these functions into a single machine that takes up less space and is easy to monitor.

Index terms: Automation in agriculture, IOT, Bluetooth module, Wi-Fi module, Arduino UNO.

INTRODUCTION

The integration of the Internet of Things (IoT) has brought revolutionary changes to the agricultural sector, particularly with the advent of IoT-based smart agriculture systems. This essay explores the transformative potential of such systems, as outlined in the abstract. By automating critical crop production processes like spray fertilization and seed sowing, and incorporating sustainable practices such as automated smart sprinklers for irrigation, this cutting-edge approach aims to revolutionize traditional farming practices. Moreover, the added convenience of remote controllability through a mobile app reduces the need for human intervention, addressing labor shortages and increasing overall efficiency. The implications of this technology hold promise for enhanced yields, resource conservation, and the promotion of sustainable agriculture, propelling the industry into a new era of productivity and environmental responsibility.

EXISTING SYSTEM AND PROPOSED SYSTEM

The availability of individual machines such as water sprinklers, land sowing devices, and other agricultural tools has undeniably improved various aspects of crop production. However, a comprehensive and integrated all-in-one smart agriculture system, combining these functionalities, remains conspicuously absent from the market. In response to this critical gap, this project introduces a proposed solution that aims to revolutionize farming practices by presenting a unified and efficient smart agriculture system. By combining water sprinkling, land sowing, and other essential machines, this innovative solution seeks to streamline farming operations, improve productivity, and contribute to more sustainable agricultural practices.

WORKING

The proposed smart agriculture project aims to streamline three crucial processes in crop production: tilling land, sowing seeds, and sprinkling water. By integrating these essential activities into a cohesive and automated system, the project seeks to enhance farming efficiency, reduce manual labor, and optimize resource utilization. Leveraging Bluetooth module HC05 and the Arduino UNO microcontroller, the project enables remote control of the entire agricultural process through a user-friendly mobile app.

Automated Tilling with Servo Motor:

The project employs a precise servo motor for automated tilling operations. Activating the servo motor causes it to till the land within a 180-degree range, effectively preparing the soil for planting. Once the desired tilling depth is achieved, the motor is turned off, and the tilling implement is retracted. This automated tilling process not only saves time and labor but also ensures uniform soil preparation for improved crop growth.

Figure 1: Servo Motor

Efficient Seed Sowing with 30RPM DC Motor:

To achieve efficient seed sowing, the project utilizes a 30RPM DC motor. This specialized motor can regulate its rotation speed, enabling controlled dispensing of seeds across the designated area. By carefully controlling the rotation speed, the motor ensures a limited number of seeds are dropped per rotation, promoting even seed distribution and minimizing seed wastage.

Intelligent Sprinkling with Moisture Sensor:

An integral part of the smart irrigation system is the incorporation of a moisture sensor. Continuously monitoring the soil's moisture content, the sensor detects when the soil reaches a specific moisture threshold. Once the threshold is reached, the automated sprinkling process is triggered, providing the plants with the necessary moisture without excessive watering. This intelligent irrigation approach conserves water resources while maintaining optimal plant hydration.

Remote Control with ESP8266 Wi-Fi Module:

Facilitating comprehensive control over the smart agriculture system, the project incorporates the ESP8266 Wi-Fi module. This module enables real-time communication between the system and the mobile app, offering remote access to start or stop any operation and adjust settings as needed. With this remote control capability, farmers can efficiently monitor and manage their crops, even from a distance.

Figure 2: ESP8266

The integration of tilling, seed sowing, and sprinkling processes into an all-in-one smart agriculture system marks a significant advancement in farming practices. Through the smart use of technology, farmers can streamline operations, reduce labor demands, and optimize resource utilization. This innovative project holds the potential to revolutionize traditional farming methods, empowering farmers to achieve higher yields, conserve resources, and contribute to a more sustainable and productive agricultural future.

PROTOTYPE:

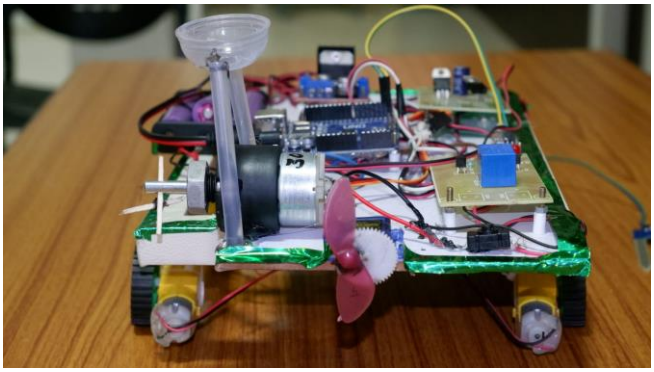


Figure 3.1: Prototype

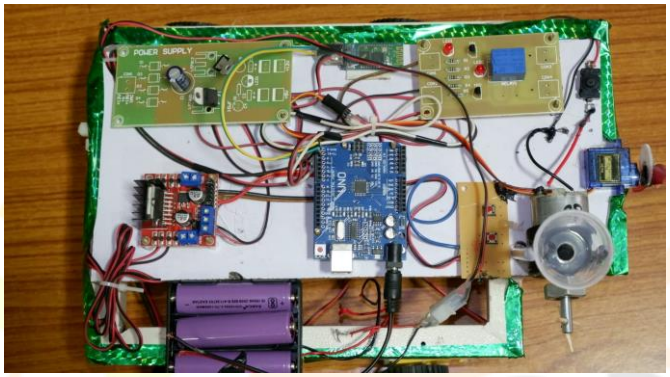
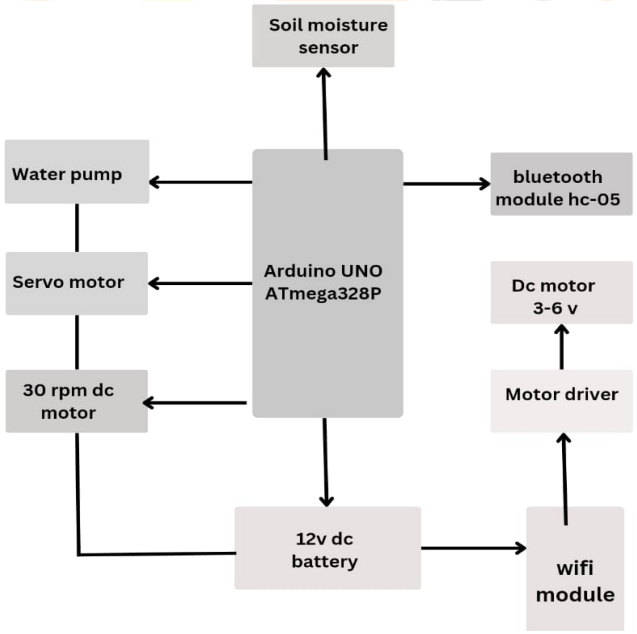


Figure 3.2: Prototype

BLOCK DIAGRAM:



RESULT:

The IoT-based smart agriculture system successfully automated crop production processes, including spray fertilization and seed sowing, resulting in enhanced production accuracy and reduced manual interventions. Sustainable practices like automated irrigation with smart sprinklers promoted resource efficiency.

CONCLUSION:

The implementation of the IoT-based smart agriculture system marks a significant leap in agricultural practices. By automating vital processes, we achieved heightened production accuracy while minimizing manual labor. The incorporation of sustainable measures,

particularly automated smart sprinklers for irrigation, demonstrated a commitment to eco-friendly farming. This technological advancement holds great promise for a more efficient and profitable agricultural future, underlining its pivotal role in securing sustainable food production while safeguarding our environment for generations to come.

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