Arduino Based Smart Irrigation Using Advanced Robot

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ABSTRACT - The agricultural sector plays a pivotal role in ensuring global food security, and advancements in technology have become essential to meet the increasing demands for sustainable and efficient farming practices. This paper introduces an innovative Agriculture Robot designed to streamline the processes of seed sowing and water spraying, thereby enhancing overall crop yield and resource utilization. The Agriculture Robot integrates state-of-the-art technologies, including precision navigation systems, real-time sensors, and automation mechanisms. The robot is equipped with a precise seed dispensing system that ensures optimal seed placement, spacing, and depth, promoting uniform crop germination. Additionally, the robot features an efficient water spraying mechanism, utilizing advanced sensors to assess soil moisture levels and crop health, enabling targeted and judicious irrigation practices. The robot employs advanced algorithms and sensors to precisely sow seeds with optimal spacing and depth, ensuring uniform germination and maximizing crop yield. Real-time soil moisture sensors and crop health monitoring enable the robot to make data-driven decisions for targeted water spraying. This minimizes water wastage while maintaining optimal moisture levels for crop growth. Farmers can remotely monitor and control the Agriculture Robot through a user-friendly interface. This feature enhances flexibility and allows farmers to adapt to changing conditions promptly. By integrating cutting-edge technologies, the Agriculture Robot presented in this paper addresses the challenges of labour-intensive and resource-inefficient traditional farming methods. The implementation of this robot has the potential to revolutionize agriculture by increasing productivity, reducing environmental impact, and contributing to sustainable and precision farming practices.

Keywords : AgriBot, ESP8266 Microcontroller, DCmotor, AndroidApp, CropWaterStressIndex(CWSI), BO motor, WirelessSensorNetwork(WSN).

1. INTRODUCTION

In this tutorial, we will guide you to building a Seed Sowing robot using an motor driver, BO motor, and an ESP8266 microcontroller. The motor driver will control the movement of the robot using App, and the BO motor will provide the necessary torque. The ESP8266 microcontroller will be the brain of the Seed Sowing robot, allowing for wireless communication and control with the new Blynk app. Agriculture is the major sector in the world that plays a vital role in developing the economy of a nation. Agri technology is the process of implementing the recent technologies to develop the crops that are being produced. The use of agri technology not only helps in improving the efficiency of the crop that are being produced but also helps in developing devices that are suitable for doing mechanical works in the fields.

LITERATURE REVIEW

[1] A.R.Al-Al,Ahmad Al Nabulsi,Shayok Mukhopadhya

As the Internet of things (IoT) technology is evolving, distributed solar energy resources can be operated, monitored, and controlled remotely. The design of an IoT based solar energy system for smart irrigation is essential for regions around the world, which face water scarcity and power shortage. Thus, such a system is designed in this paper. The proposed system utilizes a single board system-on-a-chip controller (the controller hereafter), which has built-in WIFI connectivity, and connections to a solar cell to provide the required operating power. The controller reads the field soil moisture, humidity, and temperature sensors, and outputs appropriate actuation command signals to operate irrigation pumps. The controller also monitors the underground water level, which is essential to prevent the pump motors from burning due to the level in the water well.

[2] Elsayed Said Mohamed , AA. BelalSameh Kotb Abd-Elmabod

The food shortage and the population growth are the most challenges facing sustainable development worldwide. Advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), and the mobile internet can provide realistic solutions to the challenges that are facing the world. Therefore, this work focuses on the new approaches regarding smart farming (SF) from 2019 to 2021, where the work illustrates the data gathering, transmission, storage, analysis, and also, suitable solutions. IoT is one of the essential pillars in smart systems, as it connects sensor devices to perform various basic tasks. The smart irrigation system included those sensors for

monitoring water level, irrigation efficiency, climate, etc. Smart irrigation is based on smart controllers and sensors as well as some mathematical relations.

[3]Khaled Obaideen , Bashria A.A , Maryam Nooman AlMallahi
Countries are working into making agriculture more sustainable by integrating different technologies to enhance its operation. This paper aims to highlight the contribution of SMART irrigation using Internet of Things (IoT) and sensory systems in relation to the SDGs. The study is based on a qualitative design along with focusing on secondary data collection method. Automated irrigation systems are essential for conservation of water, this improvement could have a vital role in minimizing water usage. Agriculture and farming techniques is also linked with IoT and automation, to make the whole processes much more effective and efficient. Sensory systems helped farmers better understand their crops and reduced the environmental impacts and conserve resources.
[4] Ravi Kant Jain
The water requirements in irrigation have been growing and the accurate quantity of water can be produced by a smart irrigation system. Considering this kind of need, this paper aims to develop an Internet of Things (IoT) enabled smart drip irrigation system by applying Web/Android applications that will provide a solution for continuous monitoring and controlling the drip irrigation system to avoid the problems of constant human vigilance and waste of water. It also facilitates prevention by giving automatic water to plants relying on water necessities. It can also convince be capable in Agricultural fields, Parks, Lawns, etc. With the advancement of technology, there are always reducing risks and making work simpler. The embedded system provides a solution for solving this kind of problem .

2. EXISTING SYSTEM

The conventional method for seeding is manual one but manually seed filling method suffers from various problems. Conventional techniques depend on human power and old techniques; it requires more time and more efforts.
Humans need rest, they may not be able to work in hazardous environments also large sized wheels required in muddy soil it may be compact the soil. In agriculture we require skilled man power. Need of man power can be accomplished by automating the process of soil loosening and sowing seed by robot. So conventional system suffer from various problems. The main aim of our project is to reduce the human effort, time requirement and to increase accuracy of the seed sowing project design.

3. PROPOSED SYSTEM

A predictive learning based intelligent irrigation scheduling system is designed and implemented using a low-cost WSN. Crop water stress index (CWSI) and soil moisture content are simultaneously considered as variables for irrigation scheduling strategy. The prototype of the proposed system is constructed and validated to gather data on the performance and functionality of the design. The proposed irrigation scheduling system is experimentally tested to evaluate its effectiveness. Designing an agricultural seed-sowing water spray robot with IoT app control involves combining mechanical, electronic, and software components. Below is a basic outline of the key components and steps involved in creating such a system: Chassis: Build a sturdy chassis to support the robot and house all the components.
Wheels: Use motorized wheels for movement. Seed Sowing Mechanism: Design a mechanism for controlled seed dispensing. Water Spraying System: Integrate a water spraying system to moisten the soil.

4. BLOCK DIAGRAM

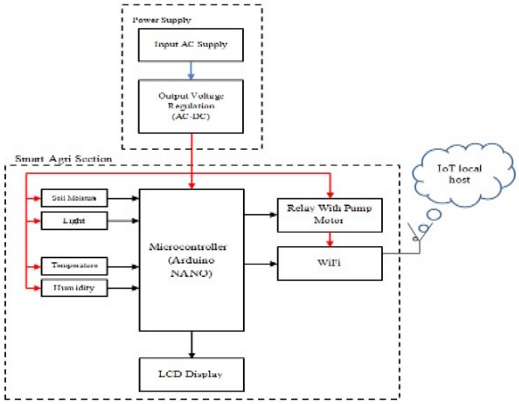

Fig .1

5. HARDWARE DESCRIPTION :-

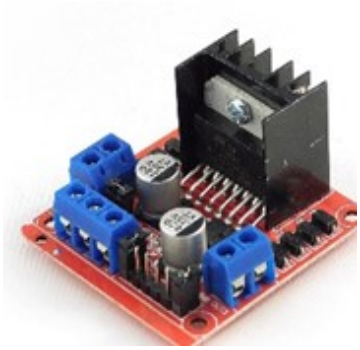

Fig 2 L298 motor driver

5.2 SEED MECHANISM

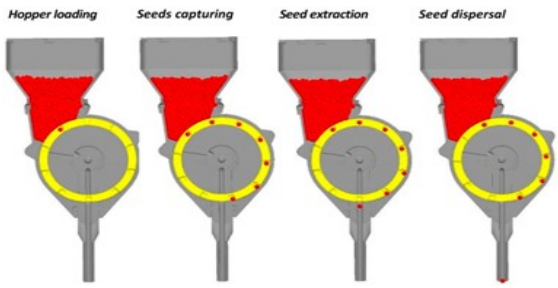

Fig 3 seed mechanism

Seed Dispersal is an adaptive mechanism in all seed-bearing plants, participating in the movement or transport of seeds away from their parent plant to ensure the germination and survival of some of the seeds to adult plants. There are many vectors to transport the seed from one place to another.

5.3 SARVO MOTOR FOR SPRAYER

Spray machines incorporating a servo motor ("servo operated spray machines") will typically undergo up to 420 acceleration and deceleration cycles a minute. spray using servo motor with high endurance bearing adopted in driving sprayer for fast up/down movement and energy saving.A servomotor is a rotary or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration in a mechanical system. Servomotors are not a specific class of motor, although the term *servomotor* is often used to refer to a motor suitable

for use in a closed-loop control system. Servomotors are used in applications such as robotics, Servomotors are generally used as a high-performance alternative to the stepper motor. Stepper motors have some inherent ability to control position, as they have built-in output steps.

5.5 ARDUINO DEVELOPMENT BOARD

If the soil is dry that means the plants need some water so the sensor sends the signals to the Arduino. The Arduino sends the signals to the relay module and the water pump is turned on for some time. You can change the time by modifying the code. Arduino UNO is the brain of this system and all the sensors and display devices are controlled by it. A Moisture sensor is used to read the Moisture content of the soil. In this system, the moisture sensor senses the moisture level of the soil and when the sensor senses a low moisture level it automatically switches the water pump with the help of a microcontroller and irrigates the plant. After supplying sufficient water, the soil gets retains the moisture hence automatically stopping the pump.

Fig 5 arduino board

5.6 BO MOTOR

Fig 6 bo motor

CONCLUSION

Our main objective was to design a smart irrigation system for approximating the water level in the agriculture field and prevent overflow or analyse the water usage. Also checks the data of sensor to prevent the over flow of excess water in irrigation area. The prototype implementation will work with a multiple scenario to process irrigation schedule on time.

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