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Automatic Soil Irrigation System Using IOT

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ABSTRACT: This project on " AUTOMATIC SOIL IRRIGATION SYSTEM USING IOT " is intended to create an automated irrigation mechanism which turns the pumping motor ON and OFF by detecting the dampness/moisture content of the earth. In the domain of farming, utilization of appropriate means of irrigation is significant. The benefit of employing these techniques is to decrease human interference and still make certain appropriate irrigation. The proposed model consists of three stages: Firstly, sensing the land's moisture levels. Second stage is the determination of its status: dry or wet. The last and third stage is Motor control. This project proposes the development of AUTOMATIC SOIL IRRIGATION SYSTEM capable of detecting loss of moisture in soil using the soil moisture sensor. Specifically, it utilizes the Soil Moisture Sensor to detect water content level in soil and give appropriate responses to the system based on detected condition. Using this response, it determines whether the land needs to be irrigated. In the current version, it can detect and irrigating a small area that can be under a single pump's coverage. It represents our most basic step towards automated farming to improve turnover and reduce the impact of draught or loss due to irrigation issues.

KEYWORDS: Automatic soil irrigation system, Soil moisturizer, farming.

I. INTRODUCTION

The greatest crisis in modern day and age is a great disparity in the agricultural sector turnover. The great losses incurred in agriculture: material losses or financial losses – most of them are attributed to crop health and quality. If the crops are determined to be not up to par, this may result in a loss. To prevent this, we need to maintain the quality of crops and keep them at maximum health. On a practical basis, this is nearly impossible for a farmer who has large lands to observe and maintain. However, this is currently being managed manually. There is a danger in this; many of the labours are preferring to work at white collar jobs, and as a result, there is a large deficiency in manpower. This makes automated farming a necessary part of the future. The greatest cause for the crops being not on par is improper irrigation (other than natural calamities). If the irrigation issues are resolved, most of the problem is solved. Hence this is the pinnacle point that needs to be renovated with technology. Automating this part of the process will be extremely beneficial to farmers. The automated plant irrigation system will help to reduce the work load on farmers, and help to keep the farmlands well always irrigated. 8 Most of the farmers all over the world suffer to maintain their crops with proper watering methods, but find themselves helpless. This system will help farmers irrigate their lands even single-handedly, without the need of additional manpower. It is user friendly simple circuitry will make the user feel comfortable in using this system. The user only needs to install the circuit and sensors and connect the pump to the circuit and its complete. The system will start functioning upon power-up, and will need no trigger to keep it running.

II. LITERATURE SURVEY

Implementation of the project required the design of the system developed in the design phase of the project to be carefully implemented. The extensive implementation of automated systems in agriculture has proven to successfully reduce cost. The operation of automated agricultural system could potentially revolutionize the irrigation process and the

way it has impacted the commercial & industrial sectors. Thus, this project has been an expert or non-expert-system-based method of field monitoring for detecting dryness & treatment of the field. The prototype system food and beverage industry have the potential to be useful for the industry, seeking ways to make agriculture cost effective. Furthermore, the ultimate beneficiaries of the project are the farmers who are the backbone of an agricultural economy.

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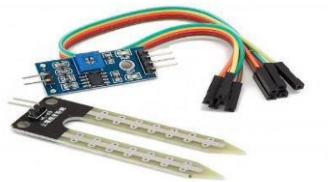
III. PROPOSED METHODOLOGY

Implementation of the project required the design of the system developed in the design phase of the project to be carefully implemented. The extensive implementation of automated systems in agriculture has proven to successfully reduce cost. The operation of automated agricultural system could potentially revolutionize the irrigation process and the way it has impacted the commercial & industrial sectors. Thus, this project has been an expert or non-expert-system-based method of field monitoring for detecting dryness & treatment of the field. The prototype system food and beverage industry have the potential to be useful for the industry, seeking ways to make agriculture cost effective. Furthermore, the ultimate beneficiaries of the project are the farmers who are the backbone of an agricultural economy.

3.1. HARDWARE REQUIREMENT

Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free-soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.



Arduino UNO

It is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Relay Board

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and retransmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the

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motor. DC motors were the first type widely used, since they could be powered from existing direct current lighting power distribution systems.

3.2. SOFTWARE REQUIREMENTS

1. The Arduino Software (IDE)
2. HARD DISK 1TB
3. WINDOWS 10

Arduino- It makes it easy to write code and upload it to the board offline. We recommend it for users with poor or no internet connection. This software can be used with any Arduino board.

IV. RESULT AND DISCUSSION

The results of such a system typically include enhanced crop health and productivity due to precise watering tailored to the specific needs of the plants. Additionally, water conservation is promoted as the system ensures irrigation is only applied when necessary, reducing waste and lowering water bills for farmers. Moreover, the automation reduces the need for manual labor, saving time and resources.

In terms of discussion, the IoT-based soil irrigation system represents a significant advancement in precision agriculture. It enables farmers to make data-driven decisions by providing real-time information about soil moisture levels, allowing for proactive adjustments in irrigation schedules. This technology is particularly valuable in regions facing water scarcity or drought conditions, where efficient water management is critical for sustainable agriculture.

However, challenges such as initial setup costs, technical complexity, and potential system failures need to be addressed. Adequate training and support for farmers in utilizing and maintaining the system are essential for successful implementation. Furthermore, ensuring the security and reliability of IoT devices and data is crucial to safeguard against cyber threats and ensure continuous operation.

V. CONCLUSION

Irrigation becomes easy, accurate and practical with the idea above shared and can be implemented in agricultural fields in future to promote agriculture to next level. The output from moisture sensor and level system plays major role in producing the output. Thus the “AUTOMATIC SOIL IRRIGATION SYSTEM USING IOT” has been designed and tested successfully. It has been developed by integrating all the features of all the hardware components used. Presence of every module has been reasoned above and placed carefully to contribute to the best working of the unit. The system has been tested to function automatically, and to the best of its ability. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the operational amplifier which triggers the DC Motor pump to turn ON and supply the water to respective field area. When the desired moisture level is reached, the system halts on its own and the DC Motor pump is turned OFF. Thus, the functionality of the entire system has been tested thoroughly and it is said to function successfully.

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