Iot And Bluetooth-Based Wireless Irrigation Automation System With A Scheduling Mechanism.

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Abstract: The automated provision of sufficient water from a reservoir to fields or home crops during all agricultural seasons has been made possible by an automatic irrigation control system. Looking at ways to eliminate human management from irrigation while still maximizing water consumption is one of the goals of this effort. To determine if to assess whether irrigation is required and how much water the land needs, a method of continuous soil moisture monitoring is used. The required quantity of water is delivered to the soil by a pumping mechanism. A modest ac-operated motor was used to build the centrifugal self-priming water pump that makes up the pumping subsystem. The suggested design also includes the following features: The suggested design also includes elements that enable the system to be wireless with the aid of GSM. Mobile devices provide user control of the system from any location. GSM is used for global wireless communication. After transmitting the message via a mobile device, the motors automatically stop when the dirt exceeds the user-determined upper threshold value. The basic function of solenoid valves is to control the water flow. The solenoid valve is controlled by electrical current flowing through a valve. using a kit for an Arduino, the solenoid valve is controlled. Sand, Silt, organic and inorganic waste, as well as ordinary soil particles, may all be filtered out using screen filters. The project's main benefits are avoiding water waste, allowing scheduling for irrigation, allowing plants to flourish to their full capacity, and reducing the likelihood of mistakes because of lower labour costs.

Keywords: Solenoid Valves, Scheduling Irrigation, Self-priming pump, GSM Module, Wireless transmission, Soil Moisture Sensor, Temperature Sensor.

INTRODUCTION:

Irrigation is crucial for ensuring high-quality agricultural production and aids in a nation's economic growth. Agriculture is seen as one of the main sources of economic progress in various nations. The development of agriculture directly affects the income of many nations. One of the most important tasks in agriculture is irrigation. Watering the crops according to their needs is crucial. Crops can be harmed by either little irrigation or excessive watering. A farmer cannot determine the soil's moisture content with the current irrigation system. Testing the soil's condition before delivering water to the agricultural field is a novel approach to conserving every drop of water. Therefore, it is possible that the watering required is sometimes greater than what the crop needs, and that water occasionally does not reach the roots of the plants. Both water and labour will be wasted in this. The development and profitability of the plant will be directly impacted if water cannot reach the roots of the plant. The conventional irrigation system needs labour. It is therefore vital to take action to improve the convenience of irrigation. To automate the traditional irrigation system, the Automatic Drip Irrigation System project was developed. It is a simple system that automates irrigation and crop watering using Arduino. Utilizing a solenoid valve that is powered by an electric source increases the system's flexibility.

There are further techniques that are based on climatic data and use a smart controller to plan irrigation water as well as irrigation being a real-time application. Use the next technique to irrigate using these strategies..

- Internet based Monitoring utilising Servers, GPRS modems, etc. with different approaches.
- GSM-SMS protocols using GSM module individually or in combination with Internet Technologies.
- Monitoring using Wireless Sensor Networks.

- Wireless sensor network with irrigation valve control.
- Wireless Monitoring using Bluetooth, Wi-Fi, Zigbee and RF.
- The range of applications has been enormous, including biomedical applications, agriculture, environment, reservoirs, bridge health monitoring, etc.

BASIC METHODOLOGY:

The essential components of this system are an ESP32TTGO Circuit Board, a GSM module, a solenoid valve, a soil moisture and Temperature sensor, a filter, and a pump. The ESP32TTGO in the proposed system is specifically configured to monitor any changes in sensor parameters, hence reducing the human component. In our system, when we press the number 1 on our smartphone, the Inbuilt GSM sends a signal to the ESP32TTGO, which then turns the motor on following the software stored in the ESP32TTGO kit. Additionally, when the engine is turned on, water will start to flow down the pipeline and into the plot, which we'll call 1. The proposed system consists of two distinct agricultural plots, each of which has a unique electrical kit that includes an ESP32TTGO Circuit Board, and a sensor. We will install a soil moisture sensor in plot 1 to measure the amount of moisture in the soil. When the soil's capacity to absorb water has been reached, the sensor will send a signal to the Arduino to turn off the valve, and the ESP32TTGO Circuit Board will then use the associated inbuilt GSM module to relay the signal back to the smartphone. The soil moisture in this system has a sensor with a set threshold value that will if the value entered associated with ESP32TTGO is accurate. the motor will remain as-is if the threshold value is less than that. updating the user via the inbuilt GSM module and if the real value is higher than the predetermined value threshold value, it will also send the user a message. using inbuilt GSM. As plot 1's ability to absorb water increases To complete, we must simultaneously turn on valve #2. Using a smartphone, we must deactivate valve 1. Once more, the identical sensor is present in plot number 2. In this manner, the user will be operated as plot number 1. With a smartphone, this method from anywhere. The suggested system would employ the screen filter to remove sand, Silt, and other small soil particles, as well as organic and inorganic trash.

LITERATURE REVIEW:

Temperature and soil moisture sensors are used in this research. in the plant's root zone, and the gateway unit controls the sensor data to a web application, as well as transfer information. One algorithm was created to determine the threshold values of sensors for both soil moisture and temperature encoded into a microprocessor to regulate the amount of water. Photovoltaic panels were utilized for power. Another relevant fact An Internet-cellular interface was utilized to see the data. and web-based programming for the irrigation scheduling page.

By **Kyada P.M**. in 2001. A study on the Relationship Between Pressure, Discharge, and Wetting patterns in a Drip Irrigation System is being proposed. It was evident that when operating pressure increased, the discharge from various drippers of all ratings increased. For a 20 lph dripper rating, the co-efficient of manufacturing variations was at a minimum of 0.86% and reached a maximum of 7.95% for a 2 lph dripper rating. Water may be applied using two lph drippers for 1, 2, 3, 4, and 5 hours, respectively, to produce wetted bulbs with maximum radii of 21 cm, 27 cm, 36 cm, 41 cm, 52 cm, and 55 cm.

The selection of irrigation methods for agriculture: drip/micro irrigation was proposed by **C.M. Burt** in 2005. Drip/Micro irrigation refers to several irrigation techniques that use emitters to provide water directly to tiny regions. The emission devices are placed close enough together for each plant's root zone to receive water through soil capillary action. Chemigation is frequently required to prevent obstruction brought on by bacterial growth and/or chemical precipitation in the laterals and emission devices.. Although labour costs are reduced by the use of drip irrigation systems, capital costs are significant.

Venturi metres built using pipe fittings were proposed as an underutilised option for measuring agricultural water in 2011 by **Tom Gill**. For a variety of applications, venturi metres made of pipe fittings can be a useful way to measure flow with dependable precision. Most of the time, there is very little actual head loss through a venture metre. It is commonly acknowledged that pipe venturi metres are a measuring device in piped systems that offers a high level of accuracy while incurring a very modest head loss.

The automated water level control system was created by **Mukthaet** al. (2013) to turn off the tank's engine in a home. With the use of a block diagram, the automation of pumps has been covered in this work. "Wireless Automatic Water Level Control System" is the name of the proposed system. It is made up of a level sensor and a metal strip that conducts electricity, and it operates on the idea that water has the ability to conduct electricity. This kind of machinery lessens the burdensomeness and the waste of water resources to some amount. Only one concept for household tank water monitoring has been suggested and examined in this work. There hasn't been a presentation of the real construction of an autonomous system with electronic circuits that is applicable to its application in agriculture.

T. Veeramani Kandasamy proposed a remote monitoring and closed-loop control solution for agricultural systems based on GSM and Zigbee in 2014. GSM was employed in this system for wireless communication and modernization. GSM allows users to control the system from any location. For connecting the GSM module and microcontroller, they utilised RS232. For improved wireless data transfer in this system, the irrigation control centre uses Zigbee technology. The key benefits of this technique include the ability to conserve manpower and the 20% and 30% reductions in water and electricity usage compared to the conventional approach. Zigbee technology has a restricted wireless data transmission range, making it impossible for users to use this system across large distances.

For an efficient water management system, **Jagtap and Shelke** (2014) describe automated irrigation based on WSN and GSM. With the help of this device, farmers can monitor and operate their irrigation systems from a distance. The ZigBee module is used to facilitate communication between the soil moisture sensor and controller. The motor and valves were controlled remotely by an Android smartphone via SMS commands. To connect with the Android phone, a GSM module has been interfaced with the controller. If the soil moisture falls below a predetermined level, the motor will turn on, and vice versa.

Professor **R.R. Jadhav** proposals for three-phase motor control via GSM was made in 2015. The technology guarantees that the motor is protected from overloads, overheating, and phase imbalances. If normal circumstances are restored, it also offers automated restarting. Due to the system's remote control via cell phone capabilities and alerts for any abnormal circumstances, farmers whose pump sets are located far from their houses find it to be a tremendous help.

An approach for creating a smart environment to track the irrigation parameter over the entire field was addressed by **Angel and Asha** (2015). Crop field monitored using a variety of nearby sensors to gauge soil moisture and temperature. The proposed system discusses the entire field, which is covered with sensor nodes, including soil moisture sensors, humidity sensors, soil pH sensors, controller nodes, solar panels, irrigation sprinklers, and control valves. The system will decide to open the valves if the moisture value and humidity value are below the predefined threshold.

The Automatic Irrigation System, created by **Geoffrey** et al. (2015), pumps 240 liters of water each day from a depth of roughly 8 metres for a small area. The water level in the tank is detected using an IR sensor in this system. According to the explanation in the paper, when an IR transmitter emits a light beam to an IR receiver, this indicates that there is nothing in their path. When the water level rises, it creates a barrier between the IR transmitter and receiver, lowering the input pin of the microcontroller and lowering its output. To determine the irrigation, they have put soil moisture sensors in the field.

Gulhane (2015) investigated the design and implementation of a multi-tank monitoring system for autonomous water level control and monitoring using low-power ZigBee wireless communication technology. There are two microcontrollers: one at the motor pump and one at the tank. The transmitter module at the specific tank is linked to the valve there, but communication between that transmitter and the reception module is wireless. If the controller finds that the tank is empty, it opens the valve that supplies water to the tank and sends a signal to the receiver module to start the motor. This automatic tank water monitoring system is designed for use in both residential and commercial settings.

Kavitha (2015) created a microcontroller-programmed algorithm with temperature and soil moisture threshold values. In the root zones of the plants, a dispersed wireless network of soil moisture and temperature sensors has been installed. A soil-moisture probe, a temperature probe, and a microprocessor for data gathering were all linked to each sensor node. When the temperature and soil moisture thresholds are met, the microcontroller allows watering to be automated. When the water level drops below 50%, the PIC notifies the phone that "Water level low" is the current state, stops the timer, and turns the LED off. The author created a programmable irrigation control system utilising Li-Fi, which primarily consists of wireless sensor networks and a monitoring centre. Li-Fi employs LED light sources to transfer data wirelessly.

The prototype automatic plant watering system was created and developed by **Archana and Priya** in 2016 using a soil moisture sensor. This paper discusses an Arduino-based device that regulates the water flow to plants and the irrigation area. In their project, they employed an Atmega328p microprocessor. The plant's soil moisture sensors won't start working until there is water on the plant field. When a plant becomes dry, soil moisture sensors detect the amount of dryness and watering is initiated. For testing purposes, a single plant in a pot was used. It was merely a concept, tested on one unit, using a prototype.

In their 2016 publication, **Chate and Rana** described a smart irrigation system for farms utilising Raspberry Pi. For the sake of automation, they employed the Python programming language. The technology includes an automated motor ON/OFF mechanism and lives crop broadcasting via Android smartphones. With this technology, Wi-Fi live crop photos may be captured. The moisture sensor was utilised to gauge the soil's moisture level. To measure the amount of moisture in the soil, copper electrodes were employed. The three-phase induction motor will switch off if the soil moisture level exceeds a specified threshold. Additionally, the relay will turn on the motor if the moisture level falls below a certain threshold. LDR sensor was utilised to regulate lighting at night. The light will turn on automatically so that we may use a mobile phone to view our farm at night.

Date (2016) interfaced the microcontroller with a variety of sensors, including temperature, soil moisture, light sensor, and water level sensor. The automated watering system has been suggested in this research. When the soil moisture sensor detects a dry situation, the relay is turned ON and the water pump is subsequently started automatically. In the suggested system, ZiggBee Module has been employed for communication.

Francis (2016) displayed a system that included sensors, a motor, a relay, an ARM microprocessor, and a GSM module. The irrigation system is based on the monitoring of soil moisture. The relay, which manages the motor's functioning, is turned on by the microcontroller. Based on the information provided by the microcontroller, the motor pumps water into the soil. When the sensor detects a very low moisture level, the motor starts. When the soil moisture level drops, GSM was utilised for communication to inform the farmer by sending the current moisture and temperature levels.

A robotic system created by **Jadhav and Hambarde** (2016) uses data from temperature and soil moisture sensors to autonomously adjust the water flow to plants. It carries a camera and uses information from plant image processing to apply fertiliser. They have put their theory to the test in the lab on a modest scale for this publication. They haven't created a fully functional system for the agricultural sector. It is a moving device with a mechanism that inserts electrodes for soil moisture sensors into the soil to monitor the moisture content. Based on readings from sensors measuring soil moisture and temperature, irrigation is administered through the pump.

In 2017, Ateeq Ur Rehman suggested a GSM-based solar autonomous watering system using moisture, temperature, and humidity sensors. This uses the YL69 soil moisture sensor. It detects the soil's moisture content. Soil moisture is essential for controlling the exchange of water and heat energy between the land surface and the atmosphere through the evaporation of plant transpiration. The main advantage of this system is that it conserves energy and water, making it more economically advantageous. With the use of the soil moisture sensor YL69, a user may quickly determine the soil's ability to absorb water. Cost is the primary determinant of any system, hence the downside of solar is that farmers cannot afford it due to its high cost.

Kriti Taneja proposed an Arduino UNO-based automatic irrigation system in 2017. In this method, a soil moisture sensor is utilised to measure the soil's moisture content or water-sucking ability. Water level sensors were also utilised. For the purpose of displaying the soil moisture content and tank water level, an LCD is linked to an Arduino board and the whole sensor. The major benefits of this technology are that it helps with irrigation in low-water locations and promotes sustainability. This system requires little upkeep, is extremely unstable, and may be easily modified to accommodate different kinds of crops. In addition to lowering costs, this effort contributes to the preservation of water, a necessity for life. This system's limitation to home farming prevents users from using it at higher levels of agriculture, which is a drawback.

Irrigation Management System with Micro-controller Application Proposed by **Prateek Jain** in 2017. To reduce labour costs and maximize water resource usage in agricultural applications, the suggested system is based on micro-controller-based automation. Functional parts like a moisture sensor and a motor load make up the system, which is built on the Arduino platform. A moisture sensor measures the soil's humidity level. The specified range of soil temperature and moisture is established specifically for the needs of individual plants, and the system is run by that range. The system does not provide the field's current state.

R. Nandhini proposed an Arduino-based IOT-based smart irrigation system in 2017. This smart irrigation system's major goal is to improve upon the present system by being more creative, user-friendly, time-saving, and effective. The pump will be linked to the driver circuit, which aids in switching the voltage, if the measured value exceeds the threshold values established in the program. The GSM module will inform the farmer of the present state of the field. The farmer may use this method to get information regarding the state of the field whenever and wherever they are. Plot count is not calculated using the system.

CONCLUSION:

Agriculture uses electronics in a variety of ways to conserve input resources and cut back on labour. Since the invention of electronics, we have been able to utilise a variety of automated and control systems to accurately apply fertiliser and water, which has enhanced agricultural output and reduced resource use. With little to no human involvement, the automatic watering system is used when it is necessary. For farmers, a necessary answer is provided by sensor-based automated irrigation systems.

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