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3 Phase Motor Water Management System using GSM

Prof. Dr. V. S. Ubale, Kanawade Ravindra, Dongare Aniket, Gore Rohan

Department of Electronics Engineering, Amrutvahini College of Engineering, Sangamner, India

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ABSTRACT

The greenhouse based modern agriculture industries are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely controlled. Due to the variable atmospheric circumstances these conditions sometimes may vary from place to place in large farmhouse, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually. It is observed that for the first time an android phone-control the Irrigation system, which could give the facilities of maintaining uniform environmental conditions are proposed. The Android Software Development Kit provides the tools and Application Programmable Interface necessary to begin developing applications on the Android platform using the Java programming language. Mobile phones have almost become an integral part of human life serving multiple needs of humans. This application makes use of the GPRS [General Packet Radio Service] feature of mobile phone as a solution for irrigation control system. In India agricultural field play a crucial role in economic development. That is the way to concentrate on that point.

Keywords : Smart Irrigation, Wireless Communication, GSM Module, ESP32S, Water Management.

I. INTRODUCTION

Technology Water management is a critical issue in agriculture, as it is essential for crop growth and productivity. However, traditional water management practices are often inefficient and wasteful. This project proposes a sensor-grade water management system for farms. The system will use moisture sensors to monitor soil moisture levels at various points in the farm and a valve control unit to operate the irrigation system. The system will also able to turn on the 3 phase motor by just SMS send by the farmer from his phone The system will be controlled by an ESP32 microcontroller and powered by solar energy. The system will be able to: farmer is able to turn on his 3 phase motor by sending SMS to specific number Monitor soil moisture levels in real time at various points in the farm Regulate the irrigation system to deliver the optimal amount of water at the optimal time to each location Be monitored and controlled remotely using the Blynk cloud-based software Agriculture is the backbone of Indian Economy.

Because without agriculture life is impossible since it is the main source of food for us. The farmer has to toil himself to produce the crop which brings him little revenue, so he has to try some other options for his sustenance, also today the availability of labor for carrying out agricultural activities is less, therefore the automation in agricultural process is needed. Thus this paper has proposed a system so that even after devoting less time to the field, the farmer can carry out his agricultural activities efficiently from remote places. In this system all the devices work on their own with the help of inputs received from the sensors which are monitoring the agricultural and round the clock and farmer can monitor whether everything is going normal or some action is needed to be taken. The entire process is controlled and monitored by programmable controller. There are many regions which suffer from inadequate rainfall. For such regions automation plays a key role in the world economy therefore, engineers struggle to come out with combined automatic devices in order to help humans in its activities so that the system automatically processes itself without any human intervention. So we would like to develop an automatic irrigation system. Basically, the project consists of electrical part and mechanical part. The electrical part consists of photovoltaic, which is used to generate electrical power and the power is stored in the rechargeable battery. The mechanical part consists of pump, which is used to pump out the water from the water source. The parameters in the project are soil humidity condition, water level condition, the position of the Sun. The solar system is used to generate the power and it provides the power to the entire system as the solar system is much cheaper than the electrical system. It is suitable to the rural area that is why the solar system is used as a power supplier to replace DC motor electricity source. It is a versatile source of renewable energy that can be used in any application. The system consists hardware and software and, finally, the integration of the two parts to provide the results. The hardware system consists of the sensors, and drivers. In hardware design, we need all the components that are necessary to accomplish the project, and these components are solar panel, DC water pump motor, sensors.

II. LITRATURE SURVEY

Joaquín Gutiérrez, developed a system which consists of distributed wireless network of soil-moisture & temperature sensors placed in the root level of the plants. The Gateway unit triggers actuators, handles sensor information, and transmits data to the web application. An algorithm was developed with threshold values of sensors which were programmed into a microcontroller-based gateway to control the water quantity [1].

Jia Uddin constructed a model of automatic irrigation system based on solar power and microcontroller where solar energy is used for source of power supply. The paddy field is enclosed with different types of sensors. After sensing the water level the sensors delivers the information to farmers through cellular phone. Without going into the field the farmer controls the motor over cellular phone. If the water level arises at danger level, the motor will be off automatically without the outline of the farmer [2].

The automatic irrigation system was tested for 136 days which resulted upon saving 90% in comparison to the traditional irrigation system. The automated system has been used successfully in other places for 18 months. The system can be used in geographically isolated area for its low cost and energy autonomy [3].

Drip irrigation is beneficial as it lowers the misuse of water by applying fertilizers and water directly to the root zone. Usage of the sensors in the setup of microcontroller based drip irrigation system has been a major development in the domain of agriculture. [4][5]

Graphical user interface software helps in anticipating the data from each WSU using any device with the

internet. Hence, from here we can obtain a real time data analysing system.[6]

The automatic irrigation technique irrigated using wireless sensor network as Zig-bee and internet technology which was developed for improving irrigation system. Sensors are placed in farm for collecting the information. Hence we can control the system automatically using internet. [7]

III. PROPOSED WORK

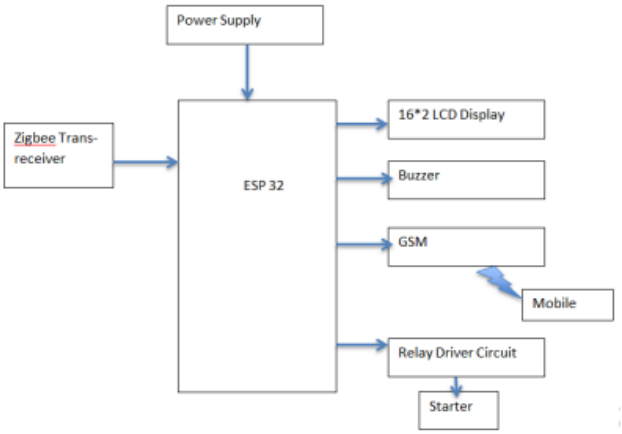


Figure 1: Block Diagram (Main Unit)

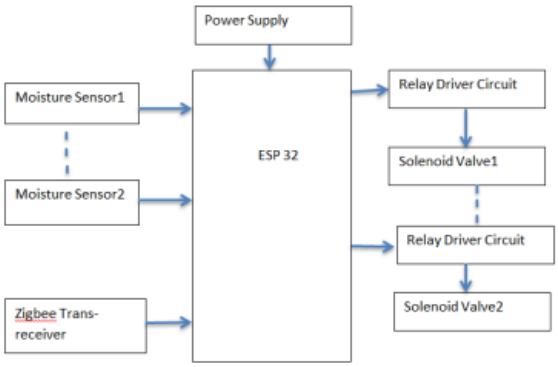


Figure 2 : Block Diagram (Sub Unit)

The main unit will collect data from the moisture sensors at various points in the farm and send it to the ESP32 microcontroller. The microcontroller will use the data to calculate the optimal amount of water to irrigate each location. The microcontroller will then send a signal to the valve control unit to activate the irrigation system.

The valve control unit will use the solar panel and battery to power the solenoid valves. The solenoid valves will be used to control the flow of water to the irrigation system.

ESP32 Microcontroller

Esp32 is already integrated antenna and rf balun, power amplifier, low-noise amplifiers, filters, and power management module • The entire solution takes up the least amount of printed circuit board area this board is used with 24 ghz dual-mode wi-fi and Bluetooth chips by tsmc 40nm low power technology, power and rf properties best, which is safe, reliable, and scalable to a variety of applications • Features: High performance-price ratio small volume, easily embedded to other products strong function with support lwip protocol, freertos supporting three modes: Ap, sta, and ap+sta supporting lua program, easily to develop. • ESP32-WROOM-32 (ESP-WROOM-32) is a powerful, generic Wi-Fi+BT+BLE MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding.

Figure 3: ESP32 Microcontroller

GSM Module

This GSM modem has a SIM800A chip and RS232 interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller using the RS232 to TTL

converter. Once you connect the SIM800 modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manger of the USB to Serial Adapter.

Figure 4: GSM Module

Soil Moisture Sensor

Measuring soil moisture is important for agricultural applications to help farmers manage their irrigation systems more efficiently. Knowing the exact soil moisture conditions on their fields, not only are farmers able to generally use less water to grow a crop, they are also able to increase yields and the quality of the crop by improved management of soil moisture during critical plant growth stages Soil moisture sensors measure the volumetric water content in soil. 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. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity.

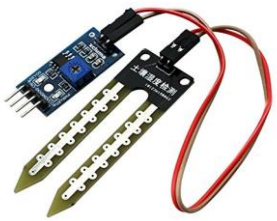


Figure 5: Soil Moisture Sensor

CC2500 Zigbee Module

The CC2500 is a low-cost 2.4 GHz transceiver designed for very low-power wireless applications. The circuit is intended for the 2400-2483.5 MHz ISM (Industrial, Scientific and Medical) and SRD (Short Range Device) frequency band The RF transceiver is integrated with a highly configurable baseband modem. The modem supports various modulation formats and has a configurable data rate up to 500 kBaud.CC2500 provides extensive hardware support for packet handling, data buffering, burst transmissions, clear channel assessment, link quality indication and wake-on-radio. The main operating parameters and the 64-byte transmit/receive.

Figure 6: Zigbee Module

LCD Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

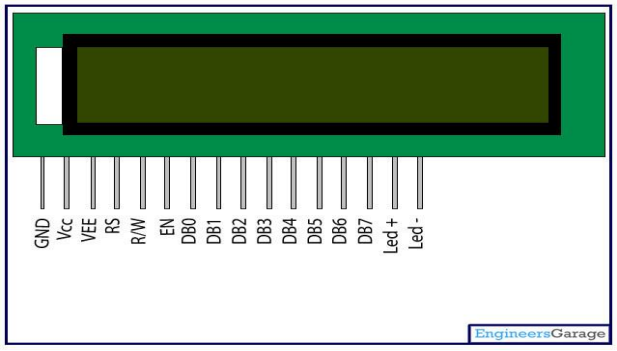
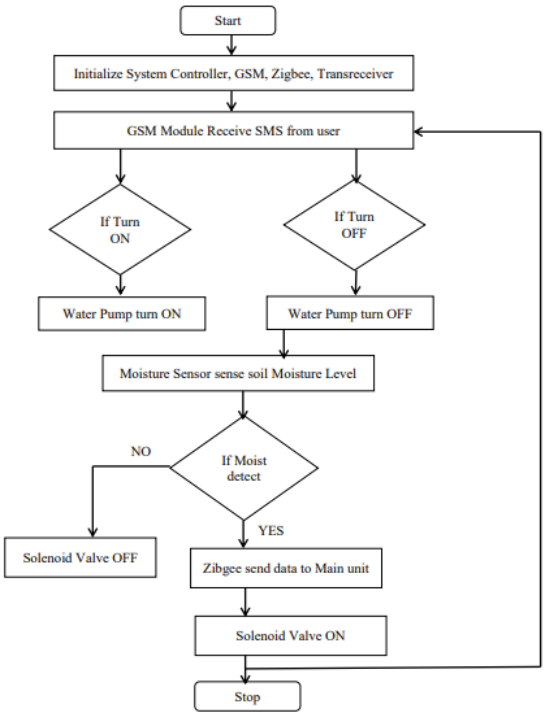


Figure 6: LCD Display

Flowchart



IV.CONCLUSION

Irrigation has been the backbone of human civilization since man has started agriculture. • As the generation evolved, man developed many methods of irrigation to supply water to the land. • In the present scenario on conservation of water is of high importance. Present work is attempts to save the natural resources available for human kind. By continuously monitoring the status of the soil, we can control the flow of water and thereby reduce the wastage. • By knowing the status of moisture and temperature through GSM with the use of moisture and Zigbee Module, water flow can be controlled by just sending a message from our mobile. Implementing a 3-phase irrigation water management system with GSM technology offers significant advantages. The integration of GSM enables remote monitoring and control, enhancing efficiency and responsiveness. This system facilitates timely irrigation, reduces water wastage, and promotes sustainable agricultural practices. Additionally, the real-time data exchange through GSM ensures effective communication, empowering farmers with valuable insights for informed decision-making. Overall, the synergy of 3-phase irrigation and GSM technology presents a promising solution for optimizing water usage in agriculture.

V. Future Scope

The future scope of 3-phase Irrigation Water Management using GSM holds tremendous potential for further advancements. Here are some potential areas of development:

- Smart Analytics and AI Integration: Incorporating advanced analytics and artificial intelligence can enhance predictive capabilities, optimizing irrigation schedules based on weather forecasts, soil conditions, and crop needs.
- Sensor Technology Enhancement: Integration of more sophisticated sensors for soil moisture, nutrient levels, and weather conditions can provide finer granularity in data, improving precision in water management.
- IoT Connectivity: Expanding the system to embrace the Internet of Things (IoT) can enable seamless connectivity between various devices, allowing for a more comprehensive and interconnected agricultural ecosystem.

Automation and Robotics: Introducing automation and robotic systems for on-field operations, such as automated irrigation equipment, can further

streamline the irrigation process and reduce manual labour.

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