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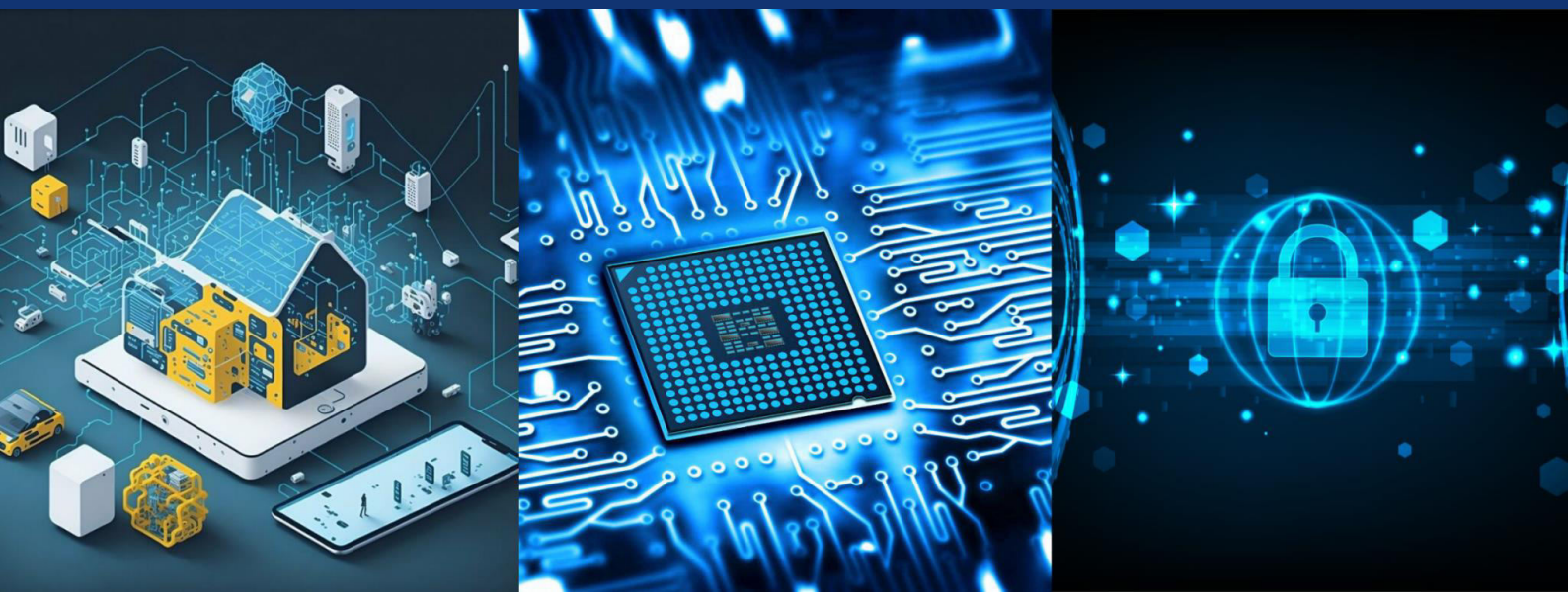

International Journal of Innovative Research in Computer and Communication Engineering

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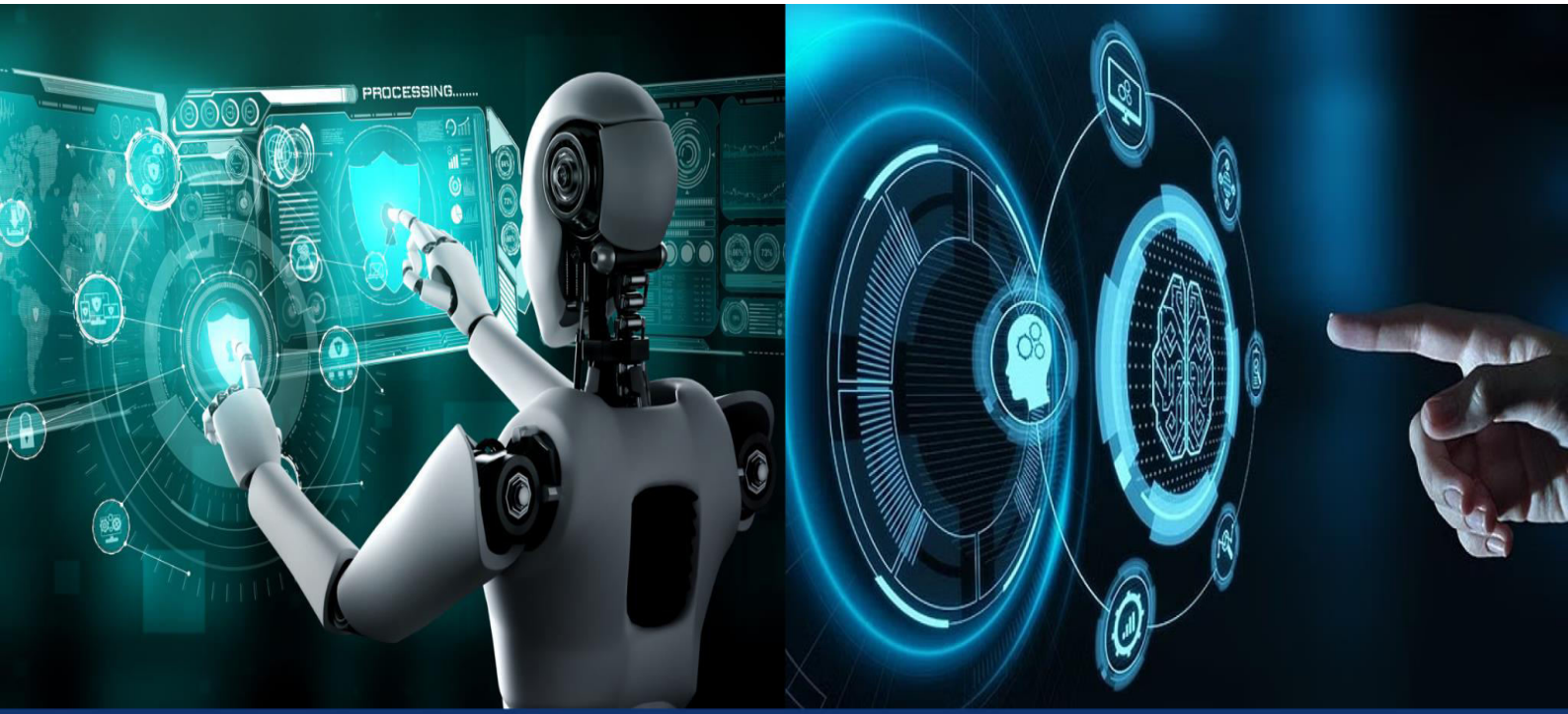

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GSM Based Agricultural Motor Control

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ABSTRACT: The agricultural sector often faces challenges such as inefficient irrigation and high labor dependency. This paper presents a GSM-based motor control system integrated with an Arduino Uno, enabling farmers to remotely control irrigation pumps using SMS commands. This system reduces water wastage, optimizes energy use, and provides a cost- effective solution for automation in agriculture.

I. INTRODUCTION

Agriculture, being the backbone of many economies, requires constant monitoring and management, especially in irrigation systems, which are critical for maintaining crop health. Traditionally, irrigation systems are manually controlled, leading to inefficiencies such as over-irrigation or under-irrigation, and often require the farmer to be physically present at the site. With the advent of the Internet of Things (IoT) and GSM technology, there is a growing trend toward automating such systems to enhance productivity and reduce manual intervention.. The proposed system uses a GSM module in combination with an Arduino Uno to enable wireless control of agricultural motors, such as water pumps used for irrigation. By sending predefined SMS commands to the GSM module, farmers can remotely turn the motor on or off, providing a cost-effective and user-friendly solution for remote irrigation control. This system uses the mobile phone as the input controlling device which cannot be connected through any other users interface. 2G networks developed as a replacement for first generation (1G) analog cellular networks. The GSM standard originally described a digital, circuit-switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via General Packet Radio Service (GPRS), and Enhanced Data Rates for GSM Evolution (EDGE). As a result of the network's widespread use across Europe, the acronym "GSM" was briefly used as a generic term for mobile phones in France, the Netherlands, Bulgaria and in Belgium. A great number of people in Belgium still use it to date. Beginning in the late 2010s, various carriers worldwide started to shut down their GSM networks.

II. PROBLEM STATEMENT

Manual control of irrigation systems in rural areas often results in water wastage or insufficient watering. This occurs due to irregular monitoring of motor operations and delayed actions. Additionally, farmers may not always be available to operate the systems, leading to inefficiencies. The solution to these challenges lies in automating irrigation systems using remote control technologies.

III. EXISTING SYSTEM

The existing System focusing on GSM based system for turning on Agricultural motor. Different control technologies are used for monitoring and control of the systems, whereas the communication between a system and a user is generally realized online via wireless communication techniques such as RF, ZigBee. Also, Mobile communication programs are utilized for developing user interfaces. However, wireless communication programs do not provide adaptability for users because of their expensive libraries. RF, ZigBee and GSM technologies are widely preferred in easy-to- use applications due to the short range between the sender and the receiver, and the small volumes of data transferred.

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DRAWBACKS:

- GSM will communicate only through2G and 3G network Only.
- So using this project we can only control the motor using only signal is available.

IV. PROPOSED SYSTEM

GSM Pump Motor Controller Circuit using Arduino In this post we are going to construct a farmer friendly GSM pump motor controller circuit which could turn on and off the irrigation system remotely from anywhere in the world via cellphone SMS and return you with an acknowledgement message. Agriculture is one of biggest industry in India which serves food for more than a billion people every year. Producing vast amount of food is never an easy task; irrigation is one of the factor. Most of the agriculturist's crop field is situated far from their residence, just controller takes a baby step towards agricultural developments.

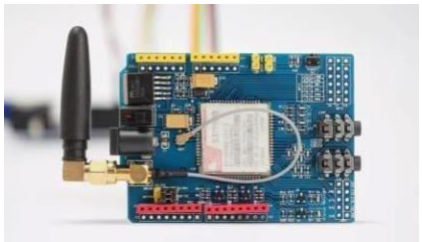
V. SYSTEM DESIGN AND METHODOLOGY

The design of the GSM-based agriculture motor control system revolves around the integration of hardware components and a structured communication mechanism to ensure seamless motor operation. The system includes four primary components: the Arduino Uno microcontroller, GSM module, relay module, and the irrigation motor. These components work in synchr- onization to receive, process, and execute remote commands via SMS.

The system consists of several key components:

Arduino Uno: This microcontroller acts as the brain of the system, managing all operations based on the received SMS commands. It processes input signals from the GSM module and triggers output actions such as controlling the relay module to switch the motor ON or OFF. Its ease of programming and compatibility with various peripherals make it an ideal choice for this project.

GSM Module (SIM900): The GSM module facilitates communication between the farmer and the system through a cellular network. It allows the Arduino Uno to receive SMS commands sent from the farmer's mobile phone. Upon receiving a command, the GSM module transmits the data to the Arduino via UART communication, where it is decoded and verified for authenticity. The module also supports optional feedback functionality, where the system can send a confirmation SMS to the user after executing a command.



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Relay Module: The relay module is responsible for controlling the high-power irrigation motor based on the signals received from the Arduino. The relay acts as an electronic switch, isolating the low-power control circuitry from the high-power motor. This ensures the safety of the electronic components and provides reliable motor operation. The relay can be configured to handle motors of various capacities, making the system versatile for different farm sizes.

Irrigation Motor: The motor, connected to the relay, serves as the actuator that pumps water to the agricultural field. Depending on the SMS command received, the relay either powers the motor to start the irrigation process or cuts off the power to stop it. The motor's operation is monitored to ensure it runs only when necessary, conserving water and energy.

The methodology begins with the farmer sending a predefined SMS command, such as "ON" or "OFF," to the SIM card installed in the GSM module. Once the command is received, the GSM module forwards it to the Arduino Uno. The Arduino processes the command, verifies its validity, and executes the corresponding action by activating or deactivating the relay. For enhanced functionality, the system can be programmed to accept commands only from authorized mobile numbers, ensuring secure operation.

VI. WORKING PRINCIPLE

The GSM module is connected to the Arduino Uno, which continuously monitors for incoming SMS. Upon receiving a message from the user, the GSM module sends it to the Arduino.The Arduino checks the received message for valid commands (e.g., “ON” or “OFF”).If the command is “ON,” the Arduino activates the relay, powering the motor and starting the irrigation process. If the command is “OFF,” the Arduino deactivates the relay, stopping the motor

1. Initialization of the System

When the system is powered on, the Arduino Uno initializes all connected components, including the GSM module and relay module.

The GSM module establishes a connection with the cellular network, ensuring it can receive SMS commands from the farmer’s mobile phone.

2. SMS Command Transmission

The farmer sends a predefined SMS command, such as “ON” or “OFF,” from their mobile phone to the SIM card inserted in the GSM module.

These SMS commands are simple text messages that indicate the desired action for the irrigation motor: “ON”: Start the irrigation motor.

“OFF”: Stop the irrigation motor.

3. Receiving and Decoding SMS Commands

The GSM module receives the SMS and transmits it to the Arduino Uno.

4. Command Execution Based on the command:

If the command is “ON,” the Arduino sends a HIGH signal to the relay module, closing the relay circuit and powering the irrigation motor.

If the command is “OFF,” the Arduino sends a LOW signal to the relay module, opening the relay circuit and turning off the motor.

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5. Safety Mechanisms

Command Authentication: The system can be programmed to accept commands only from specific mobile numbers to prevent unauthorized access.

Power Failure Handling: If there is a power failure during motor operation, the system resets, and the Arduino waits for a new SMS command after restarting.

Relay Protection: The relay module ensures safe switching of high-current motors, preventing electrical damage

6. System Reset and Monitoring

The Arduino continuously monitors the GSM module for new SMS commands in real-time.

The system remains idle until it receives a valid command from the user. This ensures efficient energy usage and reliable operation.

VII. ADVANTAGES

1. Remote Operation: Farmers can operate the motor from any location with mobile coverage.
2. Cost-Effective: The system uses inexpensive hardware components, making it affordable for farmers.
3. Simplicity: The system requires minimal technical knowledge to operate, as it is controlled through simple SMS commands.
4. Energy Efficient: By remotely controlling the motor, it ensures that the irrigation pump runs only when necessary, preventing wastage of energy.

VIII. APPLICATIONS

Automated Irrigation Systems: Allows remote control of water pumps in farms, ensuring timely irrigation. Remote Monitoring: Suitable for farms located in remote areas where farmers may not always be present on-site. Energy Management: Helps optimize the use of electricity in irrigation systems, contributing to energy savings.

IX. CONCLUSION

The GSM-based agriculture motor control system using Arduino Uno provides a reliable and efficient solution for managing irrigation systems in agriculture. By enabling remote control via SMS, the system reduces manual intervention, prevents water wastage, and improves the overall productivity of farming operations. Future enhancements can include integrating soil moisture sensors and automated scheduling for a more intelligent and autonomous irrigation system .

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