PREMIER UNIVERSITY CHATTOGRAM

DEPARTMENT OF **COMPUTER SCIENCE AND ENGINEERING**

ASSIGNMENT

COURSE NAME	Microprocessors & Micro-controllers
COURSE CODE	CSE 3815
ASSIGNMENT TOPIC	1.Home Automation System Design Using Sensors. 2.Smart Agriculture System with 32-bit Microcontroller.
DATE OF ASSIGNMENT	4-09-2024
DATE OF SUBMISSION	7-09-2024
SUBMITTED TO	
ASIF SAAD LECTURER DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING	

REMARKS	**SUBMITTED BY**	
	NAME	Rimjhim Dey
	ID	0222220005101039
	SEMESTER	4th
	BATCH	42
	SESSION	Spring 2024
	SECTION	A

Answer to the Question no: 1

Introduction:

In modern home automation, sensors play a critical role in enhancing comfort and efficiency. By integrating temperature and proximity sensors with a microcontroller, we can create a system that responds dynamically to environmental changes and user presence. This approach ensures that home appliances operate optimally, contributing to energy savings and convenience.

System Design:

Temperature Sensor:

Function: The temperature sensor (e.g., DHT11) monitors the ambient temperature in the room.

Microcontroller Interaction: The sensor continuously sends temperature data to the Arduino Uno micro-controller. When the temperature exceeds a set threshold, the micro-controller activates the air conditioning system to lower the temperature. Conversely, if the temperature drops below a certain point, the AC is turned off.

Automation Example: If the room temperature rises above 25°C, the air conditioner is switched on automatically. Once the temperature falls back to 22°C, the system turns off the air conditioner.

PIR Sensor (Proximity Detection):

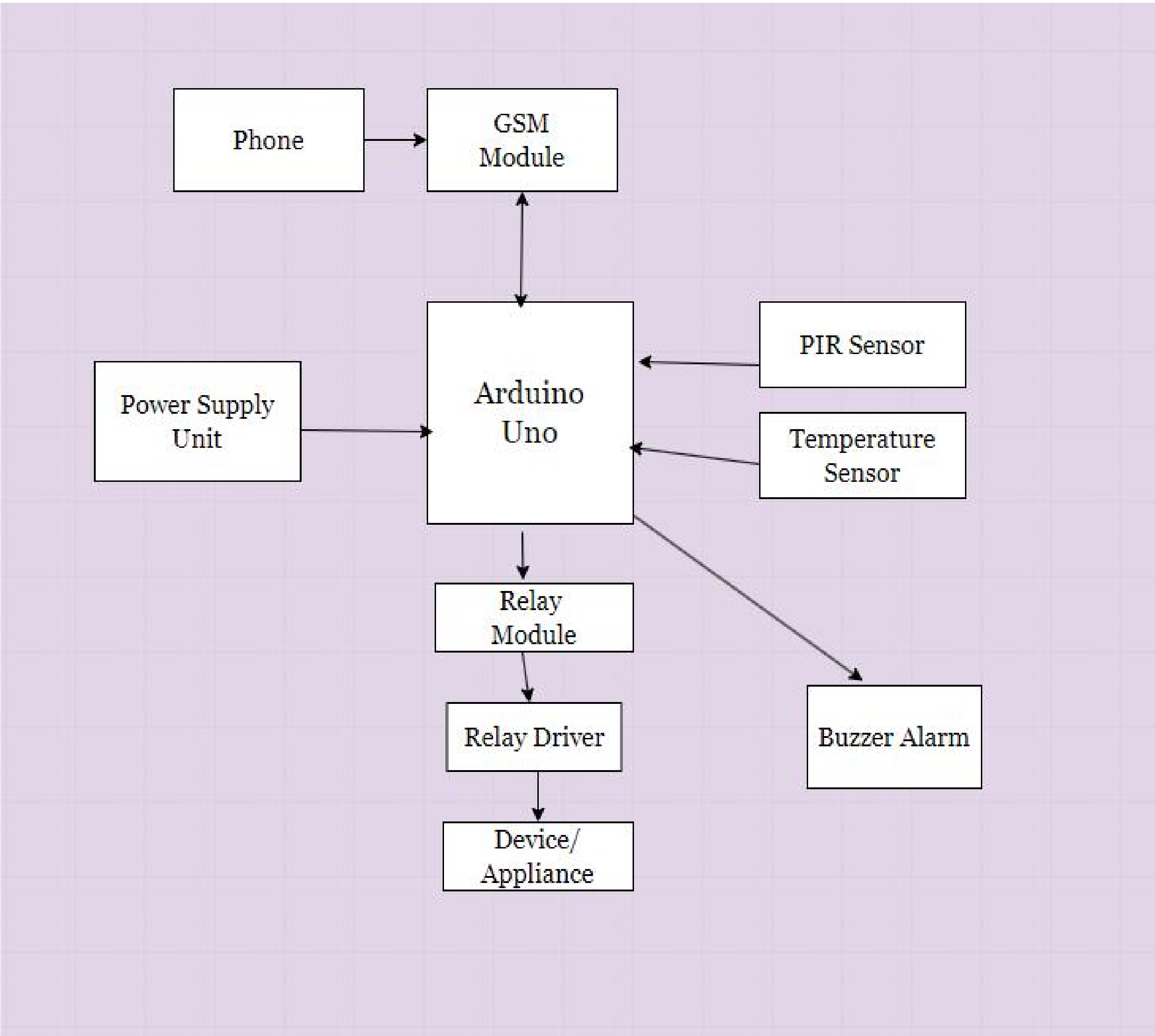
Function: The PIR sensor detects motion, indicating when someone enters the room.

Microcontroller Interaction: Upon detecting motion, the PIR sensor sends a signal to the micro-controller, which then turns on the room’s lights. After a set period of inactivity (no motion detected), the micro-controller turns the lights off to conserve energy.

Automation Example: If someone enters the room, the lights turn on automatically. If no movement is detected for 5 minutes, the lights turn off.

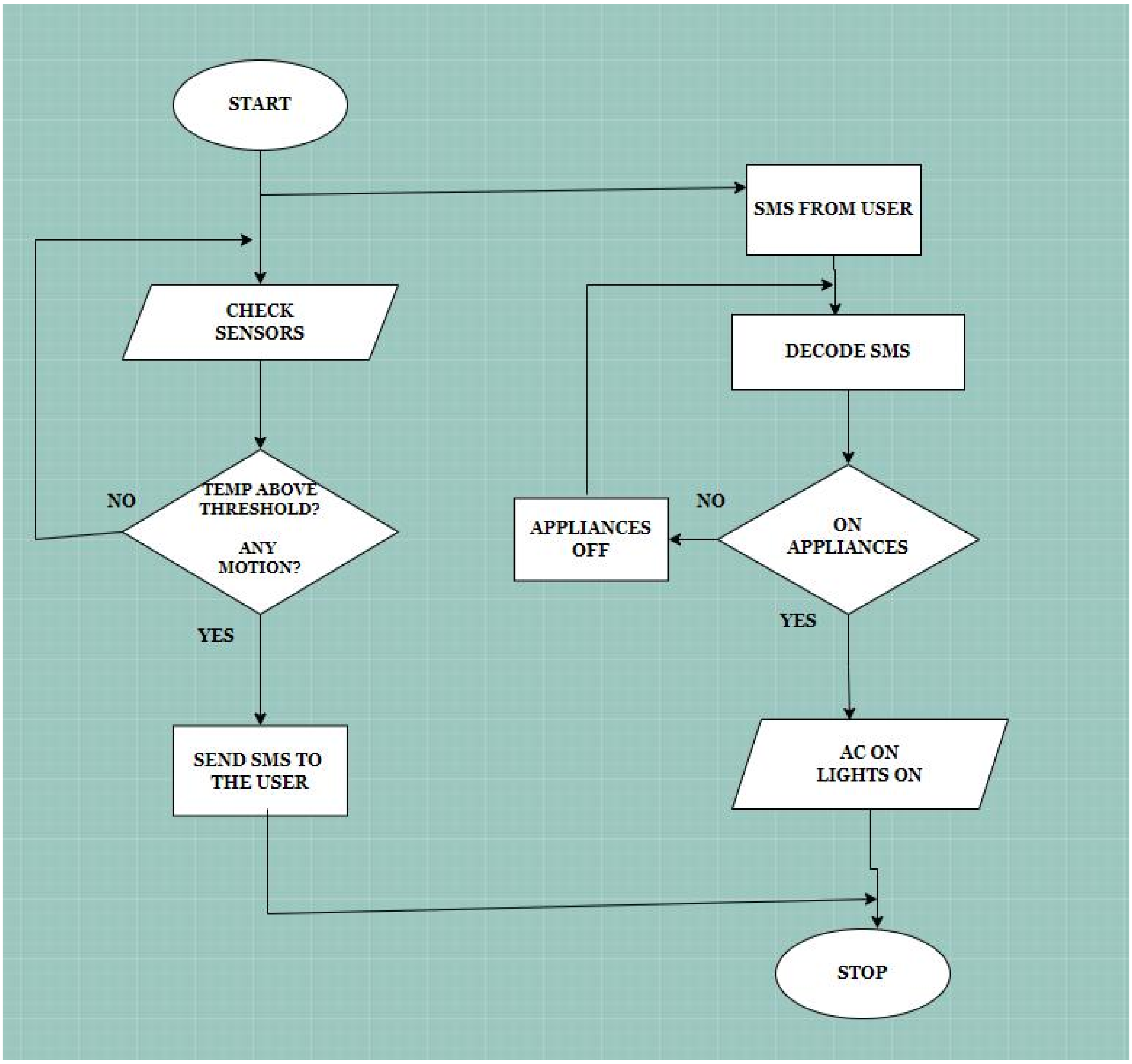
Block Diagram of the Developed System:

The block diagram shows how the Arduino Uno connects to key components like the temperature sensor and PIR sensor. The temperature sensor monitors the room's climate, while the PIR sensor detects motion. Both send data to the Arduino, which controls the air conditioner and lights through relay modules. A power supply powers the system, and a GSM module allows remote monitoring via phone. This setup ensures automated control of devices based on environmental inputs.



Flowchart of the System Operation:

The flowchart outlines the step-by-step process of how the system operates. It begins with reading inputs from the temperature sensor and PIR sensor. Based on the temperature reading, the system decides whether to turn the air conditioner on or off. Similarly, the PIR sensor detects motion, prompting the system to control the lights accordingly. Each decision is processed by the Arduino Uno, ensuring efficient automation of the home environment.



Role of Signal Conditioning:

Signal conditioning is crucial in processing raw sensor data to ensure accurate and reliable performance. For both the temperature and PIR sensors:

Temperature Sensor Conditioning: The raw output from the temperature sensor may contain noise or voltage fluctuations. The signal is filtered and possibly amplified to ensure that the micro controller receives accurate temperature readings, preventing erratic AC control.

PIR Sensor Conditioning: PIR sensors can generate noisy signals, especially in environments with electromagnetic interference. Signal conditioning filters out noise to avoid false triggers, ensuring that lights are only activated when actual motion is detected.

Sensor Accuracy:

Accuracy is critical for the reliable functioning of this system:

Temperature Sensor: High accuracy is important for maintaining comfortable indoor climates. A sensor with poor accuracy might cause unnecessary AC activity, leading to discomfort or energy wastage. A sensor with a precision of ±0.5°C is typically sufficient for home automation.

PIR Sensor: The PIR sensor's accuracy in detecting human presence ensures the lights are only turned on when someone is present. Inaccurate sensors could cause frequent false positives, wasting energy by turning on lights unnecessarily.

Conclusion:

In this home automation system, the temperature and PIR sensors interact with the Arduino Uno microcontroller to automate air conditioning and lighting. Signal conditioning ensures accurate sensor readings, while the precision of the sensors enhances the system's efficiency and reliability. This design enhances both convenience and energy savings in a home environment.

Answer to the Question no: 2

Introduction:

Efficient resource management in agriculture is critical for maximizing crop yield while minimizing wastage. By integrating a 32-bit microcontroller with ultrasonic and humidity sensors, this system provides a robust solution for monitoring soil conditions and automating irrigation.

System Design:

Ultrasonic Sensor:

Function: Measures the distance between the sensor and the soil surface, which helps infer the soil's moisture level indirectly by detecting the water level.

Microcontroller Interaction: The ultrasonic sensor transmits distance measurements to the 32-bit microcontroller. This data helps determine if the soil is sufficiently moist or if irrigation is needed.

Automation Example: If the distance is greater than a predetermined threshold (indicating that the soil is dry), the microcontroller activates the irrigation system to provide water.

Humidity Sensor:

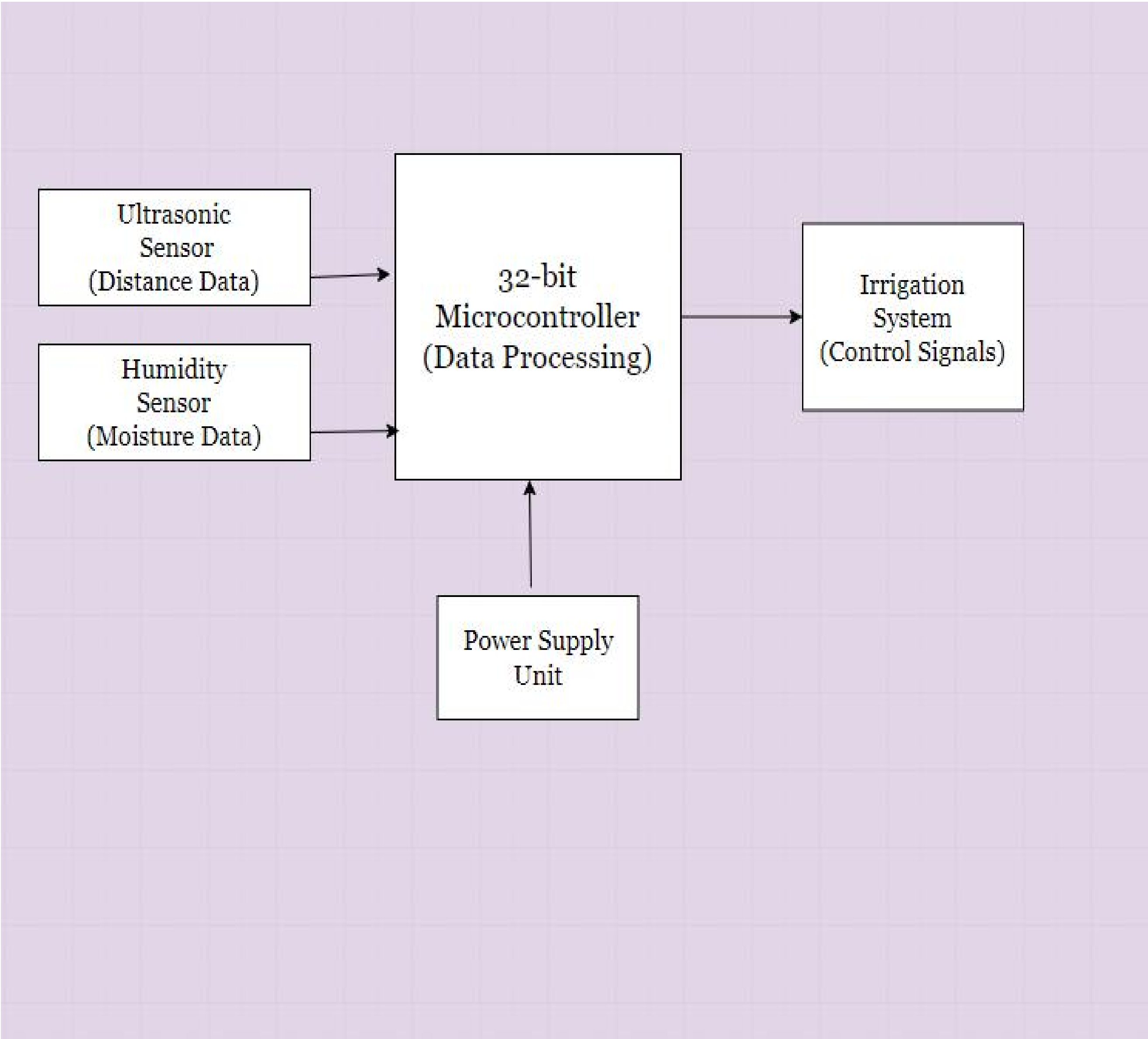
Function: Directly measures the moisture content of the soil.

Microcontroller Interaction: The humidity sensor continuously sends moisture data to the microcontroller. When the measured humidity level drops below a specified threshold, the microcontroller decides to trigger the irrigation system.

Automation Example: When soil humidity falls below 30%, the microcontroller initiates irrigation to replenish soil moisture.

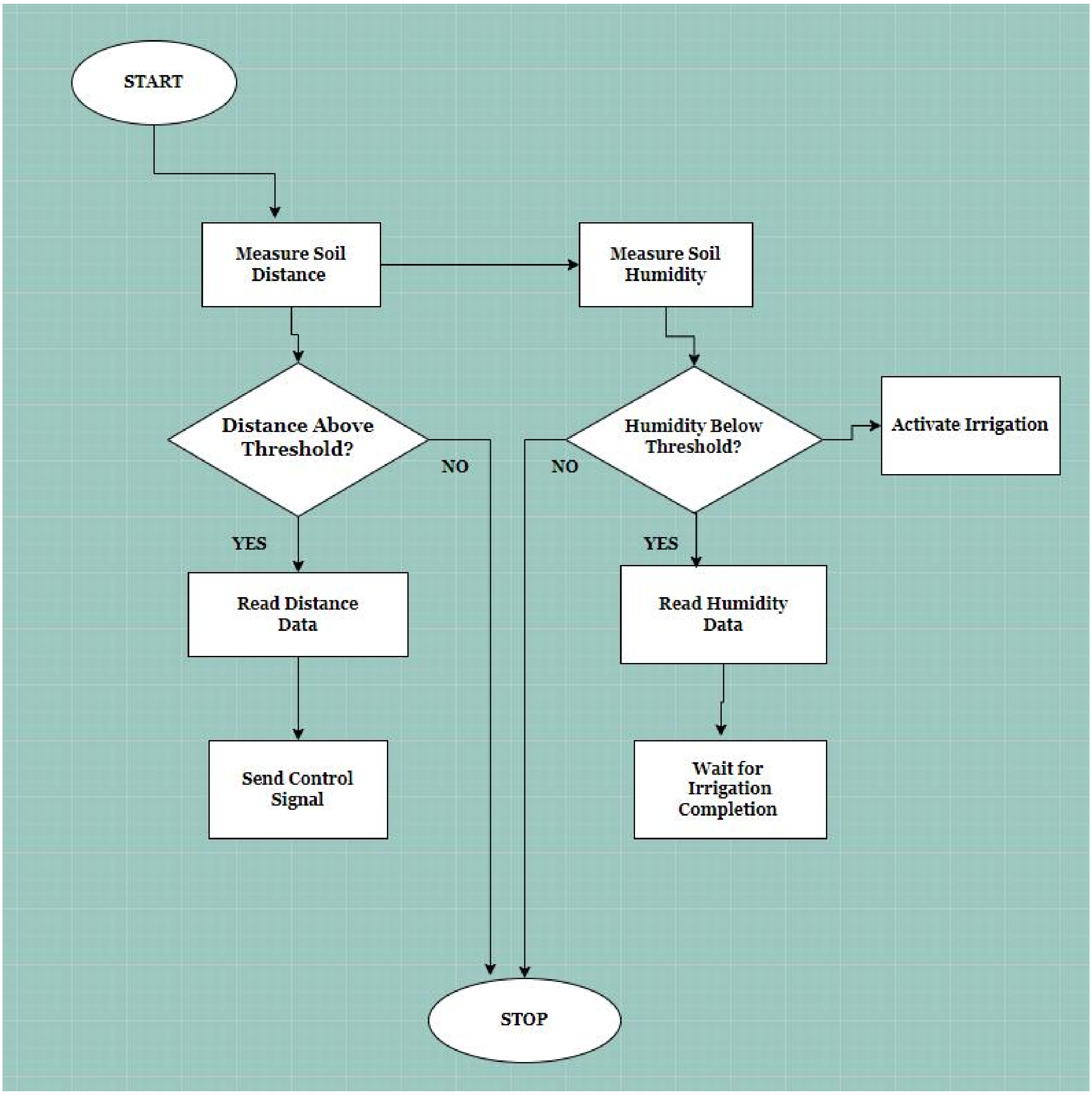
Block Diagram of the Developed System:

The block diagram illustrates the overall architecture of the smart agriculture system. It shows the key components and their interactions.



Flowchart of the System Operation:

The flowchart illustrates the operational sequence of the smart agriculture system, focusing on soil condition monitoring and irrigation automation. It begins with the ultrasonic sensor measuring soil distance to estimate moisture levels. The 32-bit microcontroller then analyzes this data to decide if irrigation is necessary. Following this, the humidity sensor provides soil moisture readings. If the soil is deemed too dry, the microcontroller activates the irrigation system. The system concludes by waiting for irrigation to complete before ending the cycle.



Sensor Data Processing in Smart Agriculture:

Ultrasonic Sensor Data:

Measurement: Measures distance to soil surface.

Processing: Compare distance with a threshold.

Decision: If distance > threshold, soil is dry; trigger irrigation.

Humidity Sensor Data:

Measurement: Measures soil moisture level.

Processing: Compare moisture level with a threshold.

Decision: If humidity < threshold, soil is dry; trigger irrigation.

Integrated Decision-Making:

Process: Analyze data from both sensors.

Action: Activate irrigation if either sensor indicates dryness; otherwise, no action.

Why a 32-bit Microcontroller?

The use of a 32-bit microcontroller is advantageous in this scenario for several reasons:

Data Handling: The system processes continuous data from multiple sensors (ultrasonic and humidity), and the 32-bit architecture allows faster, more efficient handling of large data sets.

Precision: In a precise agriculture system, exact measurements are critical. A 32-bit microcontroller offers high-resolution sensor readings, ensuring accurate decisions about when and how much water is required.

Conclusion

The smart agriculture system, controlled by a 32-bit microcontroller, automates irrigation using data from ultrasonic and humidity sensors. The system's efficiency and precision make it ideal for ensuring optimal water use, enhancing crop growth while minimizing resource waste. By combining distance measurements from the ultrasonic sensor with direct moisture readings from the humidity sensor, the system provides a comprehensive approach to soil monitoring. This integrated data analysis enables accurate decision-making about irrigation needs, leading to more sustainable agricultural practices and improved crop yield. The 32-bit microcontroller's capability to handle and process large volumes of data quickly and accurately is crucial for maintaining the system's effectiveness in real-time operations.