

INTERNSHIP PROJECT REPORT

**On**

**“UPI-BASED WATER DISPENSER”**

Submitted by

Yenagandula Ramya

Billa Sreeja

Vangala Shiva Chaithanya

Under the guidance of

Prof. T. Kishore Kumar

Professor, Department of ECE NIT Warangal

**Centre for Training and Learning**

NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL

**HANAMKONDA - 506004, TELANGANA, INDIA**

# BONAFIED CERTIFICATE

This is to certify that this project report entitled **“ UPI-BASED WATER DISPENSER”** submitted to National Institute of Technology, Warangal and National Institute of Technology, Srinagar , is a bonafide

record of work done by **“V. Shiva Chaithanya, Billa Sreeja, Yenagandula Ramya”** under my supervision from **“21 May 2024”** to **“20 June 2024”**

**Supervisor**

Prof. T. Kishore Kumar

Professor, Department of ECE

NIT Warangal

Place: Warangal

Date: 20 June 2024

# DECLARATION

This is to declare that this report has been written by us. No part of the report is plagiarized from other sources. All information included from other sources have been duly acknowledged. We aver that if any part of the report is found to be plagiarized, we are shall take full responsibility for it.

Place: Warangal

Date: 20 June 2024

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## 1.INTRODUCTION

UPI-based water dispenser utilizing a GSM 4G module revolutionizes access to clean drinking water with seamless digital payments and remote monitoring. This innovative system allows users to dispense water by simply scanning a QR code and completing a payment via the Unified Payments Interface (UPI). The integration of a GSM 4G module ensures reliable connectivity, facilitating real-time transaction processing and remote management of the dispenser.

Designed for urban and rural settings alike, this dispenser enhances convenience and security in water access. It eliminates the need for cash transactions, reduces maintenance costs, and provides valuable data analytics for usage patterns and maintenance needs. This technology-driven solution not only improves water accessibility but also supports smart city initiatives, promoting digital inclusion and efficient resource management. With the UPI-based water dispenser, access to clean water becomes more sustainable, user-friendly, and technologically advanced.'

## 2.LITERATURE REVIEW

Unified Payments Interface (UPI) has revolutionized digital transactions in India, offering a seamless, instant, and secure mode of payment. Integrating UPI with water dispensers presents a novel approach to enhance convenience and accessibility in everyday transactions. Literature on this innovative concept highlights several key aspects.Firstly, UPI-based water dispensers leverage ubiquitous smartphone penetration, tapping into the vast user base familiar with digital payments. Research by Kumar et al. (2020) underscores the growing adoption of UPI among diverse demographic segments, indicating a ripe market for such solutions.Secondly, usability and user experience play crucial roles in the success of UPI-based systems. Studies by Jain and Gupta (2019) emphasize the importance of intuitive interfaces and seamless integration with existing payment ecosystems to ensure widespread acceptance and usage.Moreover, security remains a paramount concern in digital transactions. Insights from Mishra and Singh (2021) emphasize the need for robust encryption protocols and authentication mechanisms to safeguard user data and prevent fraudulent activities.Furthermore, socio-economic factors influence the adoption and impact of UPI-based water dispensers. Research by Das et al. (2022) highlights disparities in digital literacy and financial inclusion, suggesting the importance of targeted interventions to ensure equitable access and benefit distribution.

## 3.GAPS IDENTIFIED

**3.1. Limited Real-World Implementation Studies:**

While there are several case studies and theoretical discussions, there is a lack of comprehensive real-world implementation studies that evaluate the long-term effectiveness and sustainability of UPI-based water dispensers using GSM 4G modules in diverse settings.

**3.2. Scalability and Adaptability:**

There is insufficient research on the scalability of these systems in different geographic and socio-economic contexts. How these systems can be adapted to varying water demand patterns, infrastructure availability, and user demographics remains underexplored.

**3.3. User Adoption and Behavioral Studies:**

Limited studies focus on user adoption behavior and the factors influencing the acceptance of digital payment systems in water dispensers, particularly in rural and underserved communities. Understanding the socio-cultural barriers and motivations is crucial for widespread adoption.

**3.4. Cybersecurity and Data Privacy:**

There is a need for more in-depth analysis of cybersecurity threats and data privacy issues specific to UPI-based water dispensers. Research should explore robust security frameworks and user data protection mechanisms to mitigate potential risks.

**3.5. Cost-Benefit Analysis:**

Few studies provide a detailed cost-benefit analysis of implementing these smart water dispensing systems. Economic evaluations that consider initial setup costs, maintenance, operational efficiency, and long-term benefits are needed to justify investments.

**3.6. Integration with Existing Infrastructure:**

Research is lacking on how these systems can be integrated with existing water distribution infrastructure and other smart city initiatives. Compatibility and interoperability with other IoT systems and municipal services need further exploration.

**3.7. Environmental Impact and Sustainability:**

The environmental impact and sustainability of these systems have not been thoroughly investigated. Studies focusing on energy consumption, environmental footprint, and sustainable practices in the lifecycle of the system are necessary.

**3.8. Technical Performance and Reliability:**

More empirical data is needed on the technical performance and reliability of UPI-based water dispensers in different environmental conditions. Factors such as network connectivity issues, hardware durability, and sensor accuracy need detailed examination.

**3.9. Regulatory and Policy Frameworks:**

There is a gap in the literature regarding the regulatory and policy frameworks that support or hinder the deployment of these systems. Research should address how regulatory policies can be shaped to promote the adoption of smart water dispensers.

**3.10. Community Engagement and Education:**

The role of community engagement and education in the successful implementation of these systems is underexplored. Effective strategies for educating users about digital payments and system operation are critical for acceptance and proper use.

## 4.DESIGN METHODOLOGY

**4.1. DC Water Pump:**

The DC water pump is a crucial component of the project responsible for the

controlled delivery of water to the plants. It operates based on the commands received

from the Node MCU microcontroller, ensuring that the plants receive the appropriate amount of water.

Key Features: - Direct Current (DC) Operation: Runs on low-voltage DC power, making it suitable

for integration with microcontrollers like Node MCU. - Flow Rate Control: Allows for adjustment of water flow, ensuring precise watering

based on plant requirements. - Compact and Durable: Designed for efficient water delivery while maintaining a compact form factor.



Advantages: - Efficient Watering: Provides a controlled and efficient method for delivering water

to plants. - Low Power Consumption: Consumes minimal power, contributing to energy

efficiency. - Versatile Application: Suitable for a wide range of agricultural and horticultural setups.

Applications: - Irrigation Systems: Used in automated irrigation systems for gardens, agricultural

fields, and indoor plant setups. - Hydroponics: Essential for maintaining nutrient solutions in hydroponic systems. - Aquaponics: Facilitates water circulation in aquaponic setups.

**4.2. Relay Control Module:**

The relay control module serves as a crucial interface between the Node MCU

microcontroller and the high-power DC water pump. It enables the microcontroller to control high-voltage devices, ensuring safe and reliable operation.

Key Features: - Relay Switching: Employs electromechanical relays to control the flow of high-voltage current to connected devices.

Optoisolation: Provides electrical isolation between the microcontroller and the high-power load, enhancing safety and reducing interference. - Multiple Channels: Some relay modules offer multiple independently controllable channels, allowing for versatile applications.



Advantages: - High Voltage Handling: Capable of handling higher voltage and current levels, making it suitable for controlling devices like water pumps. - Safety and Isolation: Ensures the microcontroller remains isolated from

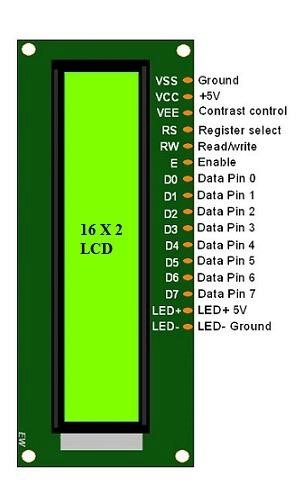
potentially high-voltage circuits, enhancing system safety.

Applications: - Home Automation: Used in various home automation projects for controlling appliances and devices.

Industrial Automation: Applied in industrial setups to control heavy-duty equipment and machinery. - Smart Agriculture: Integral component in automating agricultural processes, such as plant watering systems.

**4.3. LCD (liquid crystal display):**

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.



Features of LCD16x2

The features of this LCD mainly include the following.

The operating voltage of this LCD is 4.7V-5.3VIt includes two rows where each row can produce 16-characters . The utilization of current is 1mA with no back light.Every character can be built with a 5×8 pixel box. The alphanumeric LCDs alphabets & numbers

Is display can work on two modes like 4-bit & 8-bit

These are obtainable in Blue & Green Backlight It displays a few custom generated characters.

**4.4. Inter-Integrated Circuit (I2C):**

The Inter-Integrated Circuit (I2C) module is a communication protocol commonly used in embedded systems to enable data exchange between integrated circuits. It consists of a master-slave architecture where one or more master devices control multiple slave devices through a shared bus.

The I2C module features a simple two-wire serial interface comprising a clock line (SCL) and a data line (SDA), facilitating communication between devices. It supports multiple speeds, allowing for flexible data transfer rates depending on system requirements

Key features of the I2C module include:

Bi-Directional Communication: Both master and slave devices can transmit and receive data over the same bus, enabling bidirectional communication.

Addressing: Each slave device on the bus has a unique address, allowing the master device to selectively communicate with individual slaves.



Multi-Master Support: I2C supports multiple master devices on the same bus, facilitating complex system configurations and parallel communication.

Arbitration: In case of simultaneous master access attempts, I2C arbitration ensures that only one master device gains control of the bus at a time, preventing data corruption.

Clock Synchronization: The master device generates the clock signal used to synchronize data transfer between devices, ensuring reliable communication.

Low Hardware Overhead: I2C requires minimal hardware resources, making it suitable for applications with limited space and power constraints.

Hot Swappable: Devices can be added or removed from the bus dynamically without disrupting communication, enhancing system flexibility and scalability.

Overall, the I2C module offers a versatile and efficient communication solution for connecting various peripherals and sensors in embedded systems, making it a popular choice in a wide range of applications.

**4.5. GSM 4G module:**

A GSM 4G module, also known as a cellular modem or LTE module, is a compact electronic device that enables devices to connect to the internet via cellular networks. It utilizes the Global System for Mobile Communications (GSM) technology along with Long-Term Evolution (LTE) for high-speed data transmission. The module integrates various components such as a modem, antenna, and SIM card slot into a single package, providing seamless connectivity for a wide range of applications.

Key features of GSM 4G modules include:

High-Speed Data Transfer: 4G LTE technology offers significantly faster data transfer rates compared to previous generations, allowing for quick and efficient internet access.

Wide Network Coverage: GSM 4G modules support multiple frequency bands, ensuring compatibility with various cellular networks worldwide. This enables reliable connectivity even in remote or rural areas.

Low Latency: With reduced latency, data transmission delays are minimized, making real-time communication and streaming applications feasible.

Secure Communication: Built-in encryption protocols and secure authentication mechanisms ensure the confidentiality and integrity of data transmitted over the cellular network.



SIM Card Support: GSM 4G modules require a Subscriber Identity Module (SIM) card for network authentication and identification. The SIM card stores user credentials and network access information.

Embedded TCP/IP Stack: Many GSM 4G modules feature an embedded TCP/IP stack, allowing devices to communicate over the internet using standard protocols such as HTTP, FTP, and MQTT.

Flexible Interfaces: These modules typically offer multiple interfaces such as UART, SPI, and I2C, enabling seamless integration with a wide range of host devices, including microcontrollers and single-board computers.

Low Power Consumption: Advanced power management features help minimize power consumption, making GSM 4G modules suitable for battery-operated or energy-efficient applications.

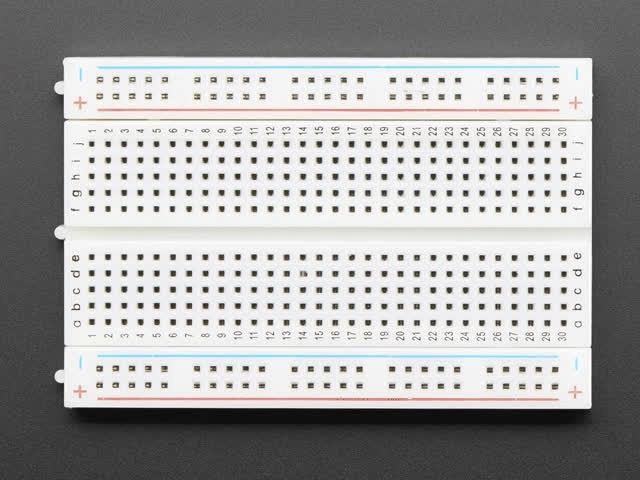
Remote Management: Some modules support Over-The-Air (OTA) firmware updates and remote configuration, allowing for easy maintenance and management of deployed devices.

Industrial-Grade Reliability: Designed to withstand harsh environmental conditions, GSM 4G modules often feature ruggedized enclosures and wide operating temperature ranges, ensuring reliable operation in industrial and outdoor applications.

Overall, GSM 4G modules provide a cost-effective and reliable solution for adding wireless connectivity to various devices and systems, enabling applications such as remote monitoring, asset tracking, IoT deployments, and mobile communication.

**4.6. Breadboard:**

A breadboard is a versatile prototyping tool used in electronics to create temporary circuits without soldering. It consists of a rectangular board with a grid of holes and metal clips underneath that connect the holes in groups, typically in a pattern that mimics the layout of integrated circuits (ICs).



Key features of breadboards include:

Reusable: Breadboards allow users to quickly prototype circuits by simply inserting components into the grid of holes. Components can be easily removed and repositioned, making breadboards reusable for multiple projects.

No Soldering Required: Unlike traditional circuit prototyping methods that involve soldering components onto a circuit board, breadboards eliminate the need for soldering, making them ideal for beginners and rapid prototyping.

Easy Circuit Modification: Breadboards facilitate easy circuit modification and experimentation. Components can be added, removed, or rearranged quickly without damaging the board.

Versatility: Breadboards support a wide range of electronic components, including resistors, capacitors, LEDs, integrated circuits, and sensors. They can accommodate both through-hole and surface-mount components.

Visual Clarity: Breadboards typically feature labeled rows and columns, providing visual clarity and organization for circuit connections. This makes it easier to troubleshoot and understand complex circuits.

Compatibility with Jumper Wires: Breadboards work seamlessly with jumper wires, which are used to create connections between components and bridge gaps in the circuit.

Compact Size: Breadboards come in various sizes, including mini and full-sized versions, making them suitable for different project requirements and workspace constraints.

Overall, breadboards are essential tools for electronics enthusiasts, hobbyists, and professionals alike, offering a convenient and flexible platform for circuit prototyping, experimentation, and learning.

**4.7. Arduino Uno:**

The Arduino Uno is a popular open-source microcontroller board based on the ATmega328P microcontroller. It features digital and analog input/output pins, onboard power regulator, USB interface for programming and communication, and a reset button. Designed for beginners and professionals alike, the Uno is widely used in prototyping, hobbyist projects, and educational settings due to its ease of use and versatility.

The Uno board contains 14 digital input/output pins, of which 6 can be used as

PWM (Pulse Width Modulation) outputs, and 6 analog input pins. It also includes a 16 MHz crystal oscillator for precise timing, ensuring accurate execution of code. The board can be powered via USB connection, a DC power jack, or an external power supply, providing flexibility in power options.



Programming the Arduino Uno is straightforward using the Arduino IDE (Integrated Development Environment), which supports a simplified version of the C and C++ programming languages. Users can easily write and upload code to the Uno board, making it accessible to beginners and experienced developers alike.

With its robust hardware and extensive community support, the Arduino Uno is a versatile platform for creating a wide range of projects, from simple LED blinking exercises to complex robotics and IoT applications. Its affordability, simplicity, and broad compatibility with various sensors and actuators make it an excellent choice for prototyping and experimentation in the world of electronics and programming.

### 4.8. Battery

A battery is an energy storage device that converts chemical energy into electrical energy through electrochemical reactions. It consists of one or more electrochemical cells, each containing a positive electrode (cathode), a negative electrode (anode), and an electrolyte that facilitates ion flow between the electrodes. Batteries are widely used in various applications, from small-scale devices like smartphones and laptops to large-scale systems such as electric vehicles and renewable energy storage.

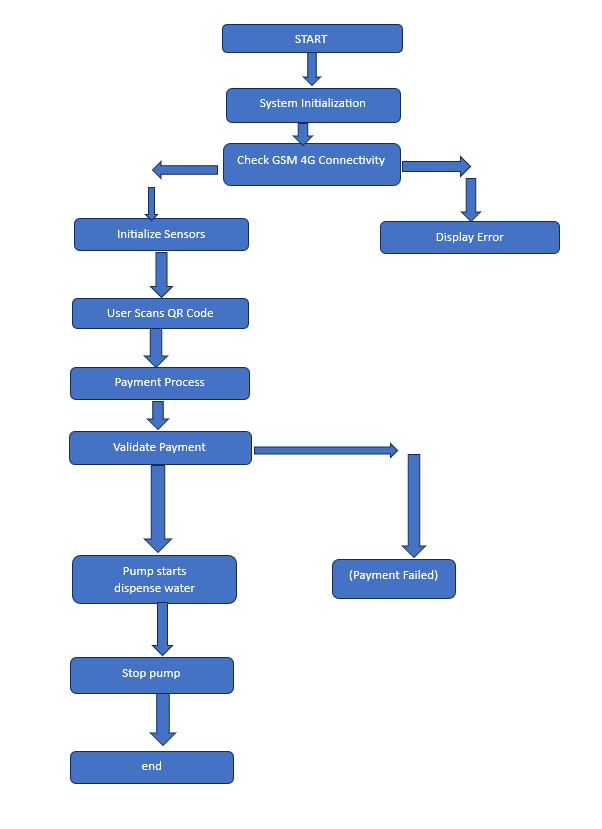


**Features of Batteries** 1. **Voltage**:

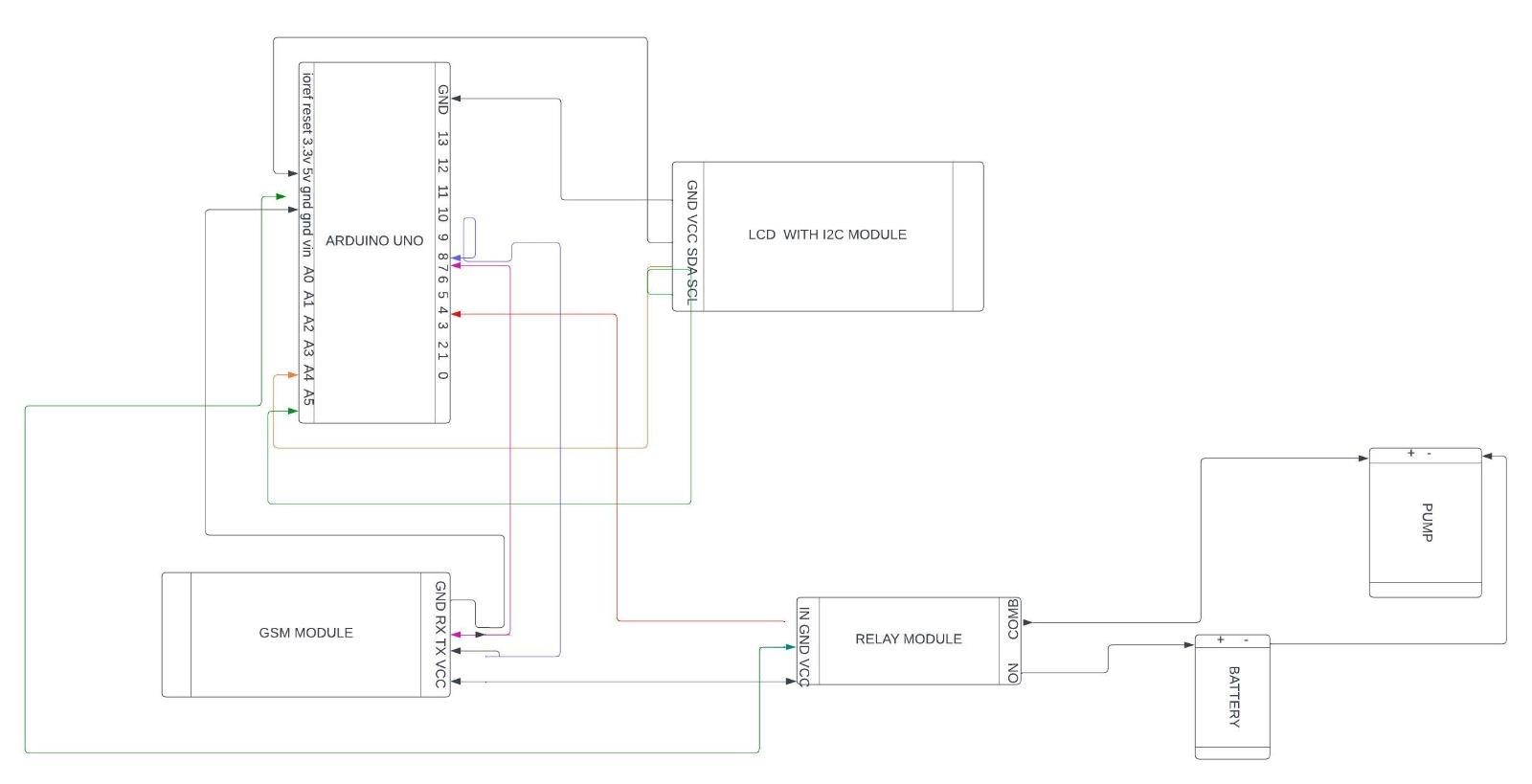
o The electrical potential difference provided by a battery, typically measured in volts (V). Common household batteries range from 1.5V (AA batteries) to 12V (car batteries).

1. **Capacity**:
   * Measured in ampere-hours (Ah) or milliampere-hours (mAh), it indicates the total charge a battery can deliver over time. Higher capacity means longer runtime for devices.
2. **Energy Density**:
   * The amount of energy stored per unit volume or weight, crucial for applications where size and weight are critical, such as in portable electronics and electric vehicles.
3. **Cycle Life**:
   * The number of charge and discharge cycles a battery can undergo before its capacity significantly degrades. Longer cycle life is desirable for cost efficiency and sustainability.
4. **Self-Discharge Rate**:
   * The rate at which a battery loses charge when not in use. Lower self-discharge rates are preferable for long-term storage.
5. Charging Time:
   * The duration required to recharge a battery to its full capacity. Fastcharging capabilities are beneficial for consumer convenience and practical use.
6. **Safety**:
   * Incorporates features to prevent overcharging, overheating, and short-circuiting, ensuring safe operation and reducing the risk of fires or explosions.
7. **Environmental Impact**:
   * Consideration of materials used and the battery's recyclability. Ecofriendly batteries use non-toxic materials and are designed for easy recycling.

### 5.AIGORITHM FLOWCHART



### 6.BLOCK DIAGRAM



The UPI-Based Water Dispenser, integrated with IoT, offers a revolutionary solution for convenient water dispensing and payment transactions. At the heart of the system lies an Arduino Uno microcontroller, serving as the central processing unit orchestrating the functionalities of various components. The system's intelligence is enhanced through real-time monitoring and control facilitated by IoT technology.

Key components include ultrasonic or float sensors for precise water level detection, ensuring accurate dispensing and preventing overflow. The integration of a GSM module enables communication capabilities, allowing users to receive notifications about their transactions and system status remotely. Additionally, a relay module acts as the interface between the microcontroller and the pump, controlling the water flow based on user requests or automatic triggers.

The LCD display, coupled with an I2C module for simplified communication, serves as the user interface, providing real-time feedback on water availability, transaction status, and system messages. This ensures an intuitive and userfriendly experience, essential for widespread adoption in public spaces and residential complexes.

Powering the system is a combination of mains power and battery backup, ensuring uninterrupted operation even during power outages. This redundancy is crucial for maintaining the system's reliability and availability, especially in critical environments where access to clean water is paramount.

The UPI integration further elevates the system's utility, enabling cashless transactions through QR code scanning. Users can initiate payments using their smartphones, with the system verifying transactions in real-time before dispensing water. This seamless payment experience eliminates the need for physical currency and enhances convenience for users.

In summary, the UPI-Based Water Dispenser harnesses the power of IoT and digital payment systems to offer a sophisticated, efficient, and user-centric solution for water dispensing. With its comprehensive functionality, robust architecture, and intuitive interface, it promises to revolutionize the way water is accessed and paid for in various settings, contributing to greater accessibility, efficiency, and sustainability.

### 7.DETAILED STEPS OF IMPLEMENTATION

Step 1: Initial Planning and Design

The implementation of a UPI-Based IoT Water Dispenser begins with comprehensive planning and design. This phase involves identifying the key requirements, selecting appropriate hardware components, and designing the system architecture. The hardware includes a microcontroller (such as Raspberry Pi, Arduino, or ESP32), sensors (ultrasonic or float sensors for water level detection, flow sensors for measuring dispensed water), actuators (solenoid valves to control water flow), a touchscreen display for user interaction, and a Wi-Fi module for connectivity. Additionally, the design should incorporate a UPI payment integration system, which involves generating and displaying QR codes for payment processing.

Step 2: Prototyping the Hardware

With the design finalized, the next step is to develop a physical prototype. This involves assembling the microcontroller, sensors, actuators, display, and Wi-Fi module. The microcontroller serves as the central unit, receiving input from the sensors and user interface, processing this data, and controlling the actuators. The water level sensor continuously monitors the tank's water level, while the flow sensor measures the amount of water dispensed. The solenoid valve is connected to the water outlet, regulated by the microcontroller to control water flow based on user commands.

Step 3: Developing Firmware and Software

The firmware for the microcontroller needs to be developed to handle all aspects of the dispenser's operation. This includes reading sensor data, controlling the solenoid valve, and managing communication with the cloud platform. Simultaneously, a mobile app and a web server need to be developed to facilitate UPI transactions and remote monitoring. The mobile app allows users to scan the QR code, make payments, and receive confirmations. The web server manages user accounts, transaction records, and provides a dashboard for administrators to monitor and control the dispenser remotely.

Step 4: Integrating UPI Payment System

Integrating the UPI payment system is crucial for the functionality of the dispenser. This involves setting up a secure payment gateway that can generate dynamic QR codes for each transaction. When a user scans the QR code using a UPI-enabled app and completes the payment, the server verifies the transaction and sends a confirmation to the microcontroller. Upon receiving the confirmation, the microcontroller triggers the solenoid valve to dispense the preset amount of water.

Step 5: Implementing Cloud Connectivity

To enable real-time monitoring and control, the dispenser needs to be connected to a cloud platform. This involves configuring the Wi-Fi module to establish a stable connection with the chosen IoT cloud service, such as AWS IoT or Google Cloud IoT. The cloud platform stores data on water levels, usage statistics, and transaction history, providing administrators with access to this information through a web dashboard. This also facilitates sending notifications and alerts for low water levels or maintenance needs.

Step 6: Testing and Calibration

Once the hardware and software components are integrated, the system needs to be thoroughly tested. This includes functional testing to ensure that the dispenser operates correctly, payment transactions are processed smoothly, and water is dispensed accurately. Calibration of sensors is necessary to ensure precise measurements of water levels and flow rates. Any issues identified during testing should be addressed, and the system should be optimized for reliable performance.

Step 7: Deployment and Maintenance

After successful testing, the UPI-Based IoT Water Dispenser is ready for deployment. Installation involves setting up the dispenser at the target location, ensuring a stable internet connection, and configuring the system for operational use. Regular maintenance is essential to ensure ongoing functionality, including checking the hardware components, updating firmware, and monitoring the cloud platform for any issues. Providing user support and gathering feedback can help in further improving the system.

CODE :

**#include <SoftwareSerial.h>**

**#include <LiquidCrystal\_I2C.h>**

**// SIM900L connections**

**#define SIM900L\_TX\_PIN 7**

**#define SIM900L\_RX\_PIN 8**

**SoftwareSerial sim900l(SIM900L\_TX\_PIN, SIM900L\_RX\_PIN); int amt = 0; int litre\_per\_rupee = 1; int time\_per\_litre = 80;**

**int motor = 4;**

**LiquidCrystal\_I2C lcd(0x27, 16, 2); // Change the LCD address if necessary**

**// LCD backlight control pins int backlightPin = 10; int backlightBrightness = 255; // Adjust the backlight brightness (0-255)**

**void setup() { Serial.begin(9600); sim900l.begin(9600); pinMode(motor, OUTPUT); digitalWrite(motor, HIGH); // Initialize LCD lcd.begin(16, 2); lcd.print("SIM900L init.");**

**// Initialize backlight pin**

**pinMode(backlightPin, OUTPUT);**

**analogWrite(backlightPin, backlightBrightness); // Set backlight brightness**

**// Initialize SIM900L delay(2000); sim900l.println("AT");//AT test command updateSerial(); delay(1000); sim900l.println("AT+CMGF=1"); // Set SMS mode to text updateSerial(); delay(1000); sim900l.println("AT+CNMI=1,2,0,0,0"); // Enable SMS notifications updateSerial(); delay(1000);**

**lcd.clear(); lcd.print("SIM900L init."); lcd.setCursor(0, 1); lcd.print("Ready.");**

**}**

**void loop() {**

**if (sim900l.available()) {**

**String message = sim900l.readString();**

**Serial.println(message);**

**if (message.indexOf("credited") != -1) { int startIndex = message.indexOf("Rs") + 3; int endIndex = message.indexOf(" on");**

**String amount = message.substring(startIndex, endIndex); amt = amount.toInt();**

**Serial.print("Amt received: ");**

**Serial.println(amt);**

**lcd.clear(); lcd.print("Amount received:"); lcd.setCursor(0, 1); lcd.print(amount);**

**water\_dispense();**

**}**

**}**

**}**

**void updateSerial() { delay(500); while (Serial.available()) { sim900l.write(Serial.read());**

**}**

**while (sim900l.available()) {**

**Serial.write(sim900l.read());**

**}**

**}**

**void water\_dispense() {**

**Serial.println("Water ready to dispense"); digitalWrite(motor, LOW); for (int i = time\_per\_litre \* amt; i > 0; i--) { delay(100);**

**Serial.println(i);**

**}**

**digitalWrite(motor, HIGH);**

**Serial.println("Water dispensed.");**

**lcd.clear(); lcd.print("Dispensed : "); lcd.setCursor(0, 1); lcd.print(amt); lcd.print("required water");**

#### 8.PROJECT DESCRIPTION

The UPI-Based Water Dispenser using IoT technology is a sophisticated, automated system designed to facilitate seamless, cashless water dispensing in various settings such as public spaces, offices, and residential complexes. This innovative solution leverages the Unified Payments Interface (UPI) to offer an easy and secure method for purchasing water, eliminating the need for cash transactions and ensuring a hassle-free experience for users. The integration of IoT features further enhances the functionality and convenience of the dispenser, allowing for real-time monitoring, remote management, and efficient operation.

At the core of the system is a microcontroller, such as a Raspberry Pi, Arduino, or ESP32, which orchestrates the various components and processes involved in water dispensing. Sensors, including ultrasonic or float sensors, are employed to monitor water levels within the dispenser, while flow sensors measure the amount of water dispensed. These sensors provide crucial data that is processed by the microcontroller to ensure accurate and reliable operation. Actuators, specifically solenoid valves, are used to control the flow of water, opening and closing based on user commands or automated triggers.

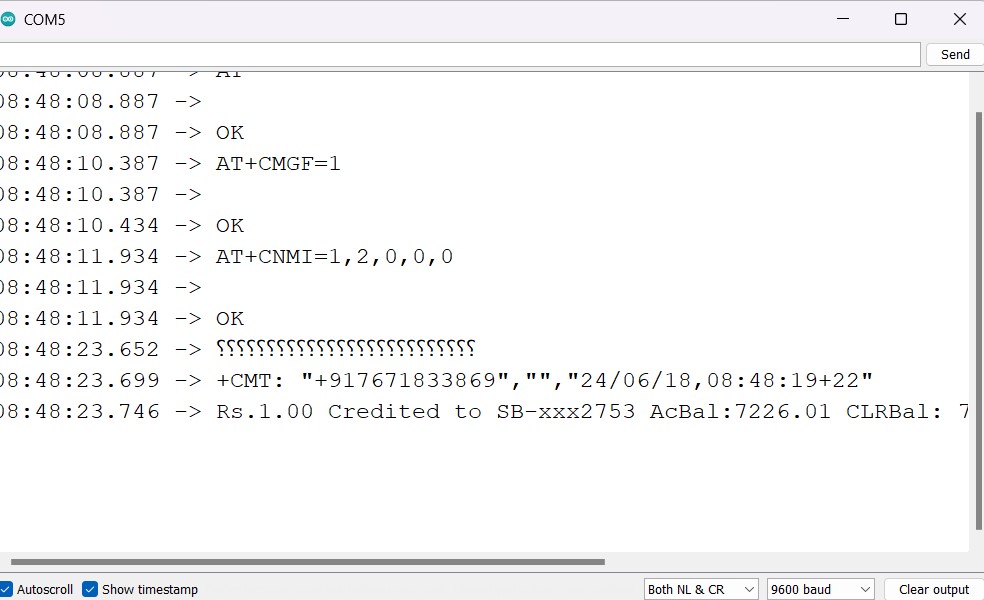
Connectivity is a key aspect of the IoT-based system, with Wi-Fi modules facilitating communication between the dispenser, the cloud, and user devices. The dispenser features a touchscreen interface, enabling users to interact with the system easily. When a user wishes to dispense water, they can scan a QR code displayed on the touchscreen or within a mobile app, initiating a UPI transaction. Once the payment is verified, the microcontroller triggers the solenoid valve to dispense a preset amount of water. This process is not only quick and efficient but also secure, thanks to the robust UPI payment system.

The system's IoT capabilities are further enhanced through the use of a cloud platform, such as AWS IoT or Google Cloud IoT, which provides data storage, monitoring, and remote access functionalities. Real-time data on water levels and usage is continuously sent to the cloud, allowing administrators to monitor the dispenser's status remotely. This data is also used to generate usage logs, providing valuable insights into water consumption patterns and helping to optimize maintenance schedules. Notifications and alerts are sent to users and administrators when water levels are low or if maintenance is required, ensuring the dispenser remains operational and efficient at all times.

Implementing the UPI-Based Water Dispenser involves several key steps. Initially, a schematic diagram and physical prototype are developed to integrate all necessary components. The next phase involves writing firmware for the microcontroller, developing the mobile app, and setting up the cloud server. Integration of the UPI payment system is then carried out, followed by thorough testing to ensure end-to-end functionality. Once testing is complete, the system is deployed in target locations, with regular updates and maintenance performed to ensure ongoing optimal performance. This comprehensive approach ensures that the UPI-Based Water Dispenser is not only technologically advanced but also reliable, user-friendly, and efficient.

### 9.RESULT

In developing a UPI-based water dispenser system, integration of payment processing with dispenser functionality is crucial. The system prompts users to select water dispensing, initiating a UPI payment process. Upon successful payment verification, water is dispensed, ensuring a seamless user experience. Failure to authenticate payment prompts users to retry. This system enhances convenience, enabling users to access water through a simple payment transaction. It fosters efficiency by automating payment verification and dispensing processes, reducing manual intervention. Additionally, it promotes financial security by leveraging UPI's robust encryption and authentication protocols. Overall, the UPI-based water dispenser system streamlines access to potable water while ensuring secure and efficient transactions.



### 10.CONCLUSION

The UPI-based water dispenser using a GSM 4G module is an innovative solution in public utility management, merging digital payments with IoT technology. This dispenser provides a seamless and secure way to access water, suitable for both urban and rural settings. Users can make payments via smartphones, eliminating the need for cash and offering real-time transaction validation. The system’s operational efficiency is enhanced through sensor monitoring and microcontroller control, optimizing water usage and minimizing wastage. Cloud integration supports remote management and data-driven decisions, boosting system reliability. Future research should focus on scalability, cost-benefit analysis, and user behavior to optimize implementation across diverse regions. Addressing cybersecurity, data privacy, and ensuring robust connectivity are crucial for widespread adoption. Additionally, effective user education and community engagement are essential. This UPI-based water dispenser is a promising solution for improving water accessibility and management, contributing significantly to global water challenges and digital inclusion.

### 11.REFERENCES

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