IOT ENABLED URBAN UTILITY MANAGEMENT SYSTEM

Mrs. P. ANITHA [1], THOKALA RAJA RAJESHWARI [2], KOLASANI TEJASWINI [3], NALLAJERLA UMA MAHESWARI [4], MANCHIMSETTI HARIKA, VEMULA BYULA [5]

[1] Assistant Professor, Department of CSE-IOT, St. Ann's college of engineering & technology, Chirala, Andhra Pradesh, India.
[2] B Tech Student, Department of CSE-IOT, St. Ann's college of engineering & technology, Chirala, Andhra Pradesh, India.
[3] B Tech Student, Department of CSE-IOT, St. Ann's college of engineering & technology, Chirala, Andhra Pradesh, India.
[4] B Tech Student, Department of CSE-IOT, St. Ann's college of engineering & technology, Chirala, Andhra Pradesh, India.
[5] B Tech Student, Department of CSE-IOT, St. Ann's college of engineering & technology, Chirala, Andhra Pradesh, India.

ABSTRACT

The "IoT ENABLED URBAN UTILITY MANAGEMENT SYSTEM" Urban utility management is a critical aspect of modern city infrastructure, ensuring the efficient delivery and consumption of essential resources such as water, electricity, and waste management. The increasing urban population and rising demand for sustainable resource utilization necessitate innovative solutions for better monitoring and optimization. Leveraging the Internet of Things (IoT), urban utility management can be enhanced to improve resource allocation, minimize wastage, and support real- time decision-making. This approach promotes sustainability, cost-effectiveness, and enhanced service delivery, ultimately contributing to the development of smart cities with improved quality of life for residents. Additionally, IoT-based urban utility management enables predictive maintenance, reducing downtime and operational inefficiencies. It also fosters data-driven governance by providing accurate insights for urban planners and policymakers. By integrating advanced technology into urban infrastructure, cities can achieve long-term resilience and sustainability. This innovative system enhances resource utilization, service delivery, and urban safety while providing a cost- effective, real-time solution for city management. Its adaptability and reliability make it a vital tool for modern urban infrastructure, ensuring efficient and sustainable operations.

1. INTRODUCTION

An embedded system is a particular type of computer system that is primarily made to carry out several activities, including accessing, processing, storing, and controlling the data in various electronics-based systems. Embedded systems are made up of both hardware and software, with the software—often referred to as firmware-being integrated directly into the hardware. These systems' ability to provide the o/p within the allotted time is one of their most crucial qualities. Embedded systems assist in improving the accuracy and convenience of the task. So, both basic and complex gadgets routinely use embedded systems. The principal real- world uses for embedded systems are in a variety of appliances, including microwaves, calculators, TV remote controls, home security systems, and local traffic management systems. An integral part of any drainage system is the access points into

it when it comes to cleaning, clearing, and inspection. Metropolitan cities have adopted underground drainage systems and the city's municipal corporation must maintain its cleanliness. If the sewage maintenance is not proper, ground water gets contaminated causing infectious diseases. Blockages drains during monsoon season, causing problems in the routine of the public. Hence, there should be a facility in the city's corporation, which alerts the officials about blockages in sewers, their exact location. It mainly acknowledges in the field of alerting the people about the gas explosion, increase in the water level and the temperature level. It uses GSM to make the drainage monitoring system in a highly automotive by using sensor for detecting and sending alerts through GSM and GPS module to the authorities. This project overcomes the demerits by detecting drainage water blockage by installing water flow rate sensors at the intersection of nodes. When there is a blockage in a particular node, there is variation in the flow of drainage water which when cross the set value will display the alert in the managing station. Also other demerits are solved by detecting.Temperature variations inside the manhole and alerting the same to the managing station. To solve all the problems related to underground sanitation, a remote alarm system is necessary for transmitting data collected by the sensors set inside the manhole to the managing station. This includes components such as controller, memory, transceiver and battery to supply power. Manhole detection and monitoring system using GSM it is a very useful system to all of us by this we detect manhole condition in this system.

We used the different components like water flow sensor,gas sensor, temperature and humidity sensor. This project overcome the demerit of paper by detecting drainage water flow speed rate by installing water flow rate sensor at the intersection of nodes when there is a blockage in a particular road there is variation in the flow of drainage in water which when across the seat value will display the alerts in the managing station by the system. we protect the health of municipality working staff. In this system we use different components this components is very high output and input components and very efficiency component buythis components and this system we detect any problem occur in manhole without any man. For a clean and healthy environment, many Indian cities have an underground drainage system that is controlled by the Municipal Corporation. To fix all drainage system concerns and to send Blynk notifications to the municipal corporation informing them of the state of the drainage system so that officials can take the necessary steps to restore the drainage system. A gas sensor was used to detect the gas produced within the biowaste drainage system, preventing it from escaping. The pressure inside the drainage system produced an explosion. The Internet of Things (GSM) is a network of physical objects that link to each other. that enables them to connect with one another. The GSM allows for remote sensing and monitoring of machines. It is a sophisticated Artificial intelligence is used in an automation and analytics environment to deliver creative and automated products and services. There frameworks have more accountability, power, and efficiency. GSM has a variety of automation applications, such as smart homes, smart parking, smart highways, and smart lighting. In our country, the corporation street light consumes more energy, most of the time street lights are switched ON when they are not in use and there are chances we forget to switch them off and also, we have all seen street light turned ON during the day.

2. LITERATURE SURVEY

S. Sulthana et al. (2020) [1]

Everyone has the right to live in a healthy environment. Flooding due to obstructed drains is a common phenomenon in Bangladesh and many other developing countries, leading to unhygienic surroundings. The air becomes poisoned due to sewage gas, resulting in health issues. Stagnant water on roads contributes to the growth of Aedes mosquitoes. Manual tracking of drain conditions is challenging, and issues often become apparent only after widespread flooding occurs. To address this, the paper proposes a warning system that

utilizes GSM technology. The system employs sensors such as MQ135 for sewage gas detection, an ultrasonic sensor for measuring sewage distance, and a water level sensor to monitor water flow. When the water level reaches a certain threshold, the system sends a text message to the authorities, pinpointing the affected areas using GPS coordinates. Additionally, real-time data can be accessed by both authorities and the public through an online website implemented using NodeMCU.

Pendharkar et al. (2020) [2]

This project aims to develop a GSM-based technology for monitoring sewage systems. The system detects humidity levels, temperature, and gas mixtures in real-time. It utilizes various sensors to measure gas concentrations and dynamically track changes. Specifically, it focuses on ensuring the safety of workers who operate under severe conditions. When gas levels exceed predefined thresholds, the system sends alerts to authorized personnel via connected mobile devices. Additionally, live video streaming allows monitoring for blockages.

U. Andrijašević et al. (2020) [3]

In this paper, a machine learning algorithm for lid opening detection in telecommunication manholes is presented. The telecommunication manholes network is equipped with smart Internet of Things (GSM) devices that use multiple sensors to monitor the system and detect various states of a manhole, such as lid opening, light detection, and object or person presence. The machine learning algorithm, developed using a recurrent neural network (RNN), specifically long short-term memory (LSTM), detects whether the lid is open or closed based on the data generated by the GSM manhole monitoring system.

3. PROPOSED SYSTEM

The proposed system builds upon the existing design, utilizing the ESP32 microcontroller to manage input sensors and output actuators efficiently. The system is powered by a Regulated Power Supply (RPS) to ensure stable voltage and operation. Various sensors, including an RTC (Real-Time Clock) for time-based operations, an IoT module for remote connectivity, an LDR (Light Dependent Resistor) for light intensity monitoring, and an ultrasonic sensor for distance measurement, provide real-time data to the ESP32. The microcontroller processes this data using embedded software and triggers appropriate outputs. The output devices include an LCD for displaying real-time information, a buzzer for alert notifications, a 12V DC LED for status indication, an AC pump for automated fluid control, and a GSM module for remote communication and alerts. The proposed system enhances automation, monitoring, and control by integrating IoT capabilities with real-time sensor data processing, making it suitable for applications requiring remote access and automateddecision-making.

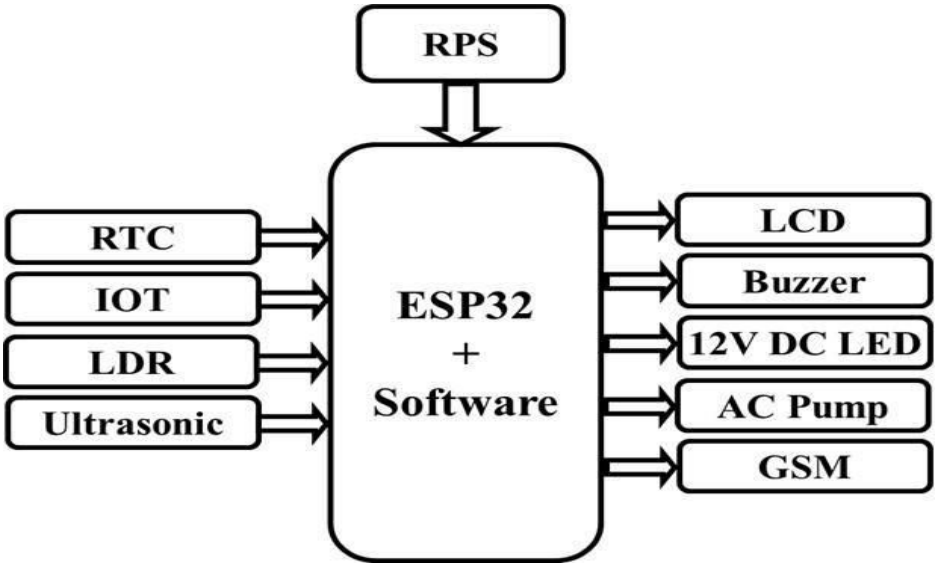

Fig-1: Block Diagram

The block diagramrepresents a systembased onthe ESP32 microcontroller, whichacts as the central processing unit, integrating multiple input sensors and output devices. A RPS ensures stable voltage for the system's operation. Inputs to the ESP32 include an RTC for time- based functions, an IoT module for remote. communication, an LDR for light intensity detection, and an ultrasonic sensor for distance measurement. The ESP32 processes data from these inputs using embedded software and controls several output components accordingly. The outputs include an LCD for displaying system status, a buzzer for alert notifications, a 12V DC LED for visual indications, an AC pump for automated fluid control, and a GSM module for communication purposes. This block diagram illustrates an integrated system capable of real-time monitoring, automation, and remote access, making it suitable for various smart applications.

Schematic Diagram

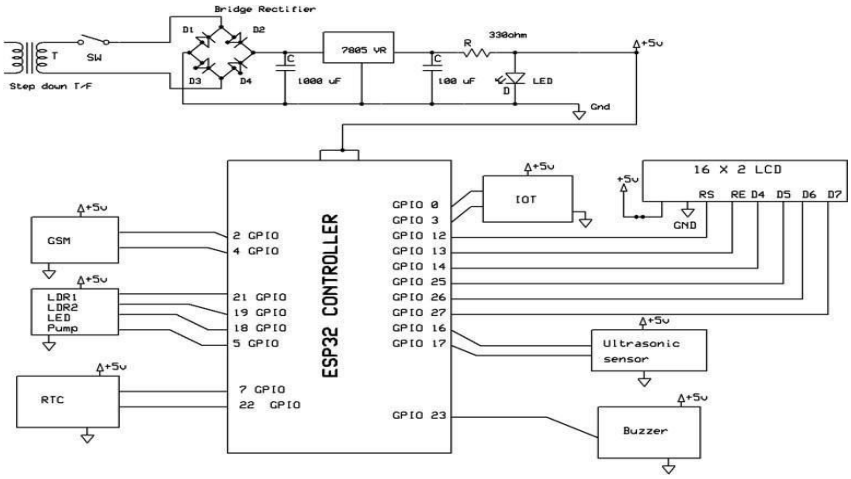

Fig2: CIRCUIT DIAGRAM

The system is powered by a step-down transformer and a regulated power supply circuit using a bridge rectifier and a 7805-voltage regulator to provide a stable 5V DC output. The ESP32 microcontroller is the core component, handling sensor inputs and controlling output devices.Pin Configuration and Connections:

1.Power Supply Section:

- o The step-down transformer converts AC voltage to a lower voltage, which is then rectified by a bridge rectifier.
- o The 7805-voltage regulator provides a stable 5V DC output to power the ESP32 and other components.

2.ESP32 Microcontroller:

- o GPIO 0, 3, 12, 13, 14, 25, 26, and 27 are connected to the IOT module for communication and control.
- o GPIO 2, 4 are connected to the GSM module, enabling remote communication.
- o GPIO 21, 19, 18, 5 are assigned to LDR1, LDR2, LED, and pump control, respectively.
- o GPIO 7, 22 are connected to the RTC module for real-time clock functionality.
- o GPIO 23 is used for an ultrasonic sensor, which helps in distance measurement.
- o GPIO 16, 17 are connected to a buzzer for alert notifications.
- o GPIO 14, 25, 26, and 27 are interfaced with a 16x2 LCD display to show real-time data and system status.

This circuit enables seamless communication and automation through ESP32, integrating multiple sensors and output devices for efficient monitoring and control.

FLOW CHART

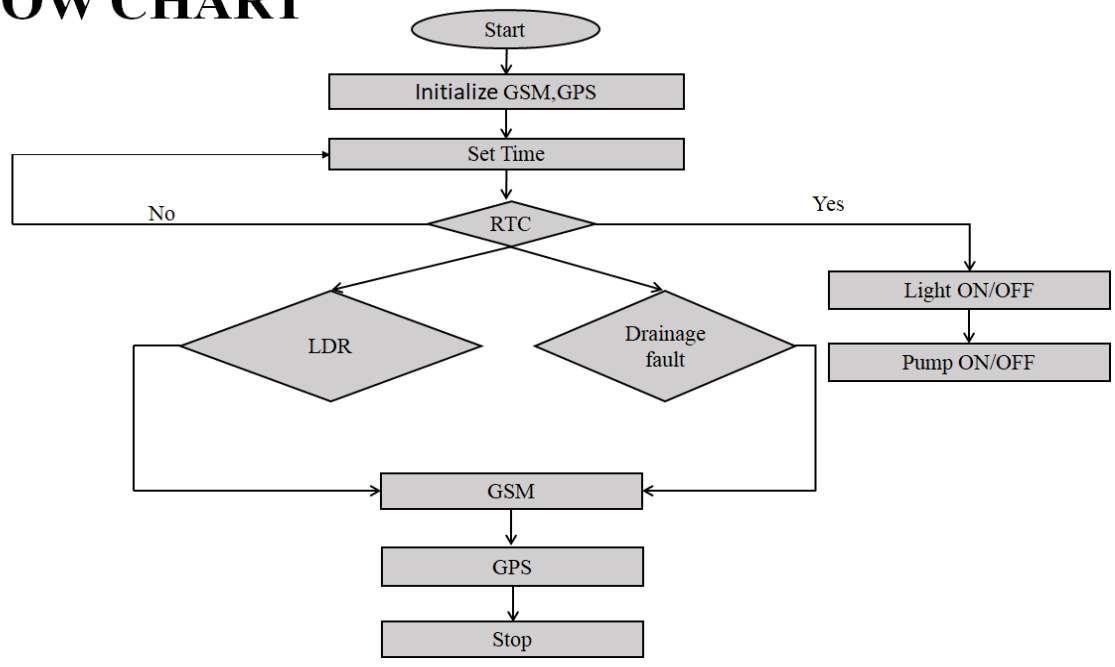

Fig3:FLOW CHART

Design and implementation of smart city by using ARDUINO is done with 3 advanced applicationssmartdrainageover flow,andSmartStreetlightingsystem.Municipaldrainagelevel

willmonitorandupdatedintooverLCDandGSMmodule.Drainagesystemweusewaterdetecting sensor which is automatically alert if it sense overflow of water. Street light applications we use LDR sensor along with LED indicator for street light.

4. RESULTS

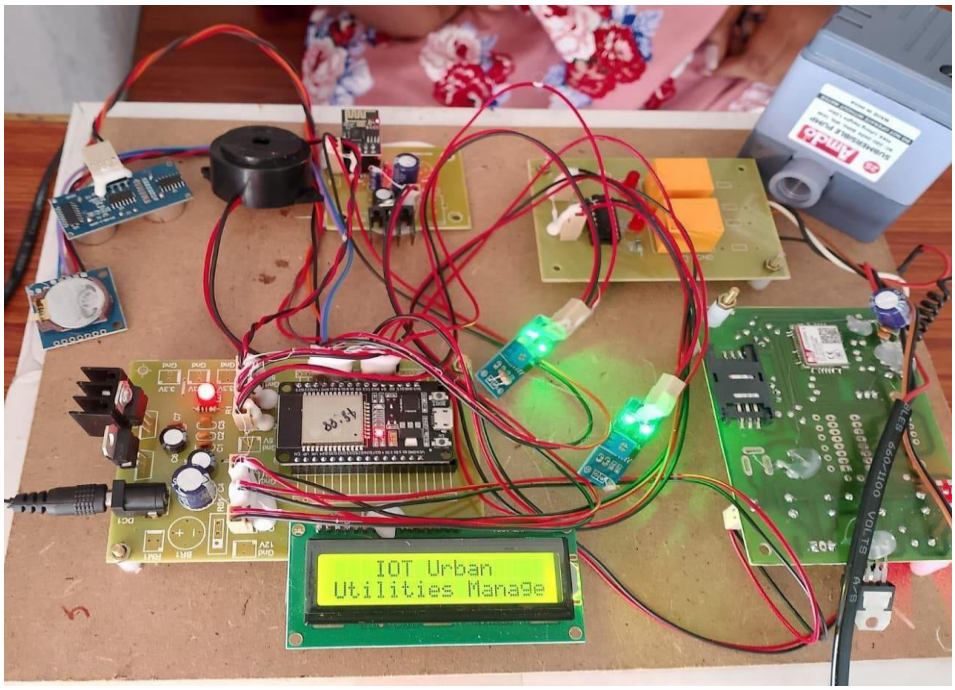

Fig4:Hardware setup of the circuit

Fig5:ProjectTitle

Fig6:StoringMobileNumber

Fig7:AlertsindicatingtheStateofApplication

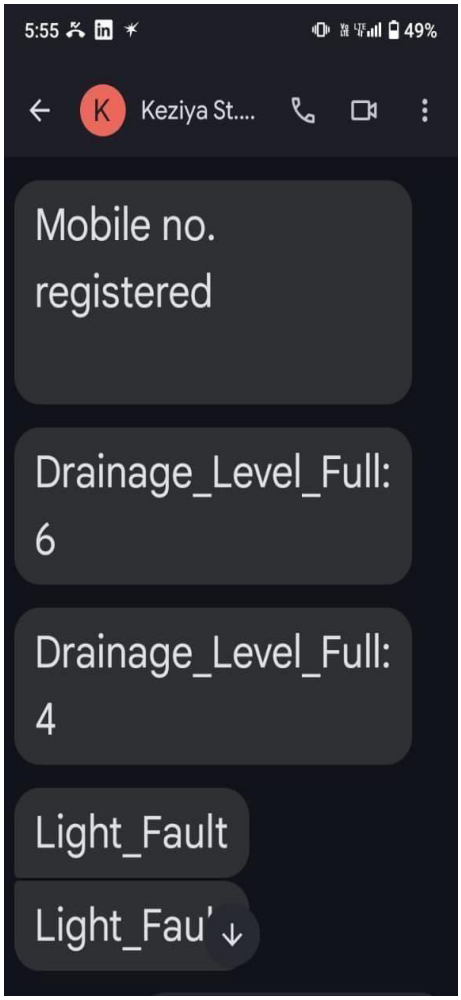

Fig 8: Alerts in the phone

5. CONCLUSION

The proposed system, based on the ESP32 microcontroller, successfully integrates various sensors and output devices to enable automated monitoring and control. Utilizing real-time data from RTC, IoT, LDR, and ultrasonic sensors, the system ensures efficient decision- making and remote communication via GSM. The inclusion of an LCD display, buzzer, LED indicators, and an AC pump further enhances its functionality, providing real-time feedback and automation capabilities. With a regulated power supply ensuring stable operation, the system is reliable and efficient for practical applications. This project demonstrates the effectiveness of ESP32 in smart automation, offering a scalable and cost- effective solution for various real-world implementations.

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