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SEWAGE BLOCKAGE DETECTION AND MONITORING SYSTEM USING IOT

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ABSTRACT

Sewage blockage is a critical issue that leads to urban flooding, contamination, and environmental hazards. Traditional inspection methods are labor-intensive and hazardous, requiring workers to manually check and clear blockages. Monitoring the drainage system is essential to maintaining the cleanliness and health of the city. Due to the incompetence of manual monitoring, drainage issues are handled slowly and take longer to resolve.The system uses a wireless sensor network made up of sensor nodes to mitigate all of these problems. The suggested system is a real-time, IoT-based, low-maintenance system that sends a message to the managing station if a manhole breaches a set of threshold values. In addition to helping the public, this technology lowers the risk of mortality for manual scavengers who clean the subterranean drainage system..This smart robotic system reduces human intervention, enhances safety, and improves maintenance efficiency. The combination of IoT,robotics makes it a cost-effective solution for urban drainage management. Sewage Blockage Detection System that uses a four-wheeled robotic vehicle equipped with ESP32-CAM for real-time video surveillance, ultrasonic and IR sensors for obstacle detection,and gas sensors for hazardous gas monitoring.The system is controlled by Node MCU ESP8266, which processes data and transmits it to a Blynk IoT app or a local web server for remote monitoring.A high-pressure jet system is integrated to clear minor blockages autonomously.

KEYWORDS: IoT, Robotics, Blynk IoT, Ultrasonic and IR sensors

1. INTRODUCTION

With the rapid expansion of urban settlements and increasing population density, the demand for reliable, efficient, and intelligent waste management systems has never been more critical. Among these,sewage systems play a pivotal role in maintaining urban sanitation and public health. However, conventional sewage systems are often prone to blockages due to the accumulation of debris, non-degradable waste, and sedimentation. These blockages can lead to overflows,foul odour emissions,infrastructure damage, and even the spread of hazardous diseases. The lack of real-time monitoring and proactive maintenance mechanisms further exacerbates these issues,making them difficult to detect until significant damage has occurred.To address these challenges, the proposed system introduces a smart, IoT- enabled robotic solution for real-time detection and monitoring of sewage blockages. This system integrates a mobile bot equipped with a suite of sensors and modules to navigate through sewage pipelines, detect anomalies, and transmit critical data to a centralized monitoring interface.Data collected by the sensors is transmitted to a remote dashboard via the Blynk IoT platform or a local web server, allowing users to monitor live video feeds and sensor statistics, and receive alerts for any detected anomalies. project aims to present the design,implementation and

Research Paper

performance of the

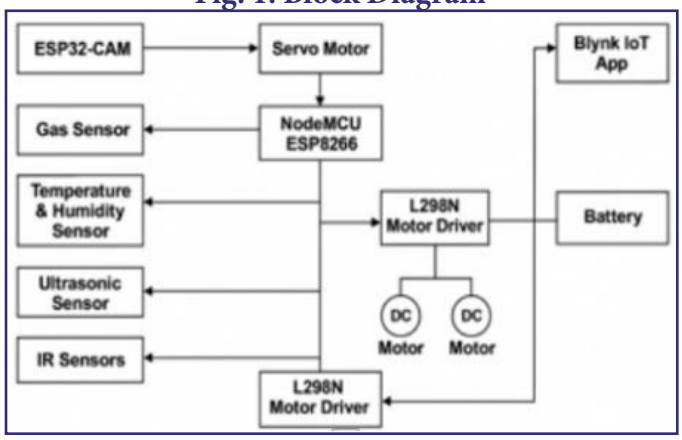
Proposed IoT- based sewage blockage detection and monitoring system, highlighting its potential as a scalable solution for smart city infrastructure and urban sanitation management.

2. PROBLEM STATEMENT

Sewage systems are one of the most essential infrastructures in urban and rural areas, responsible for maintaining hygiene,sanitation, and public health. However, frequent sewage blockages caused by solid waste, grease, silt deposition, and non-biodegradable materials lead to overflow,foul odor,water contamination,and damage to pipelines. These problems often remain undetected until major overflows occur, resulting in high maintenance costs and environmental hazards. At present, manual inspection methods are commonly used to detect sewage blockages.These inspections are time-consuming,unsafe and inefficient,especially in underground and confined spaces. Workers are exposed to toxic gases,pathogens, and the risk of accidents during physical inspection and cleaning. The lack of real-time monitoring and early warning systems delays corrective actions and increases the severity of blockages.To overcome these challenges,there is a need for an automated IoT-based sewage blockage detection and monitoring system. By integrating various sensors such as ultrasonic sensors, gas sensors, IR sensors,temperature and humidity sensors, and ESP32-CAM for visual monitoring,the system can continuously monitor sewage flow levels, detect anomalies, and identify blockages in real-time. The use of Node MCU ESP8266 or ESP32 microcontrollers allows the data to be transmitted wirelessly to a Blynk IoT platform or local web server, where authorities can monitor conditions remotely and take timely action.This system aims to reduce manual intervention,improve response time, and enhance safety by providing continuous, real-time, and reliable data about the sewage network.It also enables preventive maintenance by detecting early signs of blockages before they escalate into severe issues,ensuring a cleaner and more efficient sewage management process.

BLOCK DIAGRAM

Fig. 1: Block Diagram



BLOCK DIAGRAM DESCRIPTION

The proposed system for sewage blockage detection and monitoring is designed using multiple electronic components integrated through the Node MCU(ESP8266) micro controller,which serves as the central control unit. Various sensors including the Ultrasonic Sensor, Infrared (IR) Sensor, Gas Sensor, and Temperature and Humidity Sensor are interfaced with the Node MCU to continuously monitor the sewage parameters.The Ultrasonic Sensor is utilized to measure the water level within the drainage system,while the IR Sensor helps in detecting the presence of solid waste or blockages. The Gas Sensor is responsible for sensing the emission of harmful gases such as methane or ammonia,which indicates the level of pollution or decomposition. The temperature and Humidity Sensor provides environmental data that supports the system's overall monitoring function .An ESP32-CAM module is connected to the Node MCU to capture real-time images or video of the sewage pipeline.A Servo Motor is interfaced with the camera module to adjust its orientation for better visibility inside the pipe.The motor movement for blockage clearance or mobility is controlled through an L298N Motor Driver,which acts as an interface between the Node MCU and DC motors. A Water Pump is connected through suitable fittings and controlled via the Node MCU using a relay mechanism to enable automatic cleaning when a blockage is detected.The entire system is powered by a rechargeable Battery Pack that supplies the required operating voltage to each component.

The Node MCU communicates the collected data and live status to the Blynk IoT Application through

Wi-Fi,enabling remote monitoring and control via a smart phone or web dashboard.A Waterproof Light Source is placed near the camera module to assist in capturing clear images under dark conditions within the sewage system. All these components work together to ensure real-time detection, visualization,and management of sewage blockages. This integrated IoT-based approach ensures efficient maintenance and monitoring of sewage networks with minimal human intervention.

3. EXPECTED RESULTS & DISCUSSION

The IoT-based Sewage Blockage Detection and Monitoring System was successfully designed and implemented. The system efficiently detected changes in water level, gas concentration, and temperature inside the sewage pipeline. When blockage or overflow was detected,an automatic alert was sent to the monitoring system through IoT (Blynk/Thing Speak platform).The ESP8266 Node MCU collected real-time sensor data from the ultrasonic sensor, gas sensor (MQ4), and DHT sensor,while the ESP32-CAM provided visual monitoring of the sewage line.The system was able to detect blockage based on abnormal water level rise,identify harmful gas emissions during blockages,send alerts and images to the user dashboard and mobile app,enable continuous remote monitoring and maintenance planning. Thus, the developed prototype proved to be effective, low-cost, and reliable for real time sewage monitoring and early blockage detection.

4. CONCLUSION

The IoT-based Sewage Blockage Detection and Monitoring System provides an efficient, automated and smart solution for managing sewage pipelines. By integrating sensors such as ultrasonic, gas,temperature, and humidity sensors with micro controllers like Node MCU ESP8266 and ESP32-CAM, the system continuously monitors the condition inside sewage pipes. The use of IoT connectivity enables real time data transmission to a mobile application or web dashboard , allowing authorities to take immediate action in case of blockages, gas leaks, or abnormal conditions. Additionally, the inclusion of a motorized cleaning mechanism helps in clearing minor blockages automatically, reducing the need for manual intervention. This project not only ensures cleaner and safer sewage systems but also promotes public health, reduces maintenance costs, and supports smart city infrastructure. Overall, it demonstrates the potential of IoT technology in addressing urban sanitation challenges effectively and sustainably.

REFERENCES

1. S. Talukder, R.A. Khan, and M. M. Hasan, "U Sen Sewer: Ultrasonic Sensor and GSM Arduino Based Automated Sewerage Management," 2017 International Conference on Current Trends in Computer,Electrical, Electronics and Communication .
2. Y. K. Priyanka, A. M. Rakesh, and A. A. Manasa,"Detection and Get Rid of Blockage in a Manhole Pipe Using IoT,"2020International Conference on Recent Trends in Electronics, Information & Communication Technology .
3. P. Bhosale, K. Pawar, S. Shinde, and A. Patil, "IoT Based System for Detection of Sewage Blockages," Information Technology and Industry 2021.
4. D. Misra,A.Patel,and H. Dubey,"Artificial Intelligent Based Smart Drainage System," Research Square Preprint, 2022. [Online].
5. A.Khanke and A. Naik,"Autonomous Anti-Clogging Sewerage System Using IoT," 2020 IEEE International Conference for Emerging Technology.
6. P. Roosipuu, T. Tamm, and J. Vain, "Monitoring and Control of Smart Urban Drainage Systems Using NB-IoT Cellular Sensor Networks," Water Science &Technology, 2023.
7. K. Rajaram, N. P. Mehta, and S. Ravi, "IoT Based System for Sewage Overflow Prevention Using Heterogeneous Communication Networks," Asian Journal of Water, Environment and Pollution, 2023.
8. S. Das, A. Sengupta, and R. Kar, "Design and Implementation of Internet of Things (IoT) on Physico Biological Treatment of Waste water," CLEAN – Soil, Air, Water, 2023.
9. A pipeline inspection robot for navigating tubular environment sin Science Robotics a compact smart-material–driven robot for pipeline inspection in constrained environments .
10. Study on Dynamic Characteristics of Pipeline Jet Cleaning Robot,Robotics, vol. 13, no.2, 2024 discusses designs and cleaning dynamics of robots that inspect and clean internal pipe walls.