JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

SMART REAL-TIME DRAINAGE MONITORING SYSTEM

RAHUL KRISHNAN V
ECE Dept
K. S. Institute of Technology

SUMUKHA S
ECE Dept
K. S. Institute of Technology

TARUN PRASANNA
ECE Dept
K. S. Institute of Technology

TEJAS N REDDY
ECE Dept
K. S. Institute of Technology

Dr. P N SUDHA
HOD, ECE Dept
K. S. Institute of Technology

ABSTRACT

Every individual has the right to live in a healthy environment. Blocked drains often cause flooding in many other developing countries, leading to unhygienic conditions. Consequently, sewage gas poisoning of the air leads to a host of health issues. One of the main causes of the increase in Aides mosquito populations is standing water on the road for extended periods of time. It is difficult to track manually because issues don't always become apparent until they are completely blocked and the area is underwater. This study suggests a warning system that creates sensed data using IOT and GSM techniques and sends it to the controlling authorities to stop such incidents before they have a chance to affect the public. An ultrasonic sensor detects sewer gas, a water level sensor tracks water flow, and a MQ135 sensor measures sewer distance. Real-time data monitoring will be possible for both the public and the authorities through an online website that uses NodeMCU. When the level hits a predetermined level, it will use GPS to pinpoint the location of the problematic areas and send a text message via GSM to report the issues. The user can modify the threshold values to fit their preferences. Because the system shows real-time data and ensures timely notifications to the appropriate authority, people in the neighbourhood can live healthier lives.

Keywords: GSM, Alert system, MQ135, Ultrasonic Sensor, Water Sensor, GPS Module

INTRODUCTION

Millions of people live in large cities, where drainage systems are crucial. The foundation for land dryness from excess, wasted, and rainwater is the drainage system. Monitoring drainage conditions is necessary to keep it functioning properly. Not every area has a drainage monitoring team, in actuality. It results in sporadic drainage condition monitoring. The neighbourhood's flooding is caused by the salutation that results from blocked drainage, which is partly due to the irregular monitoring. Additionally, manual monitoring is inept. The sensors are used by the monitoring system. The microcontroller reads the data from the sensor and uses the GSM module to send the data to the server. The information received is very helpful in identifying any obstructions or clogs in the drainage system. The authorities in question receive the data, which aids in their efforts to clear the system of obstructions. GPS is used to pinpoint the blockage's location for the authorities.

LITERATURE SURVEY

According to Hemamalini M. and Puvaneshwari S.'s work "Smart Real Time Drainage Monitoring System Using Iot" (April 2022), an intelligent drainage system with sensors to detect obstructions, floods, and gasses should be designed. The system senses harmful gases like methane (CH_4), sulphur dioxide (SO_2), and carbon monoxide (CO) and generates alarms when gas levels exceed threshold values. It also looks for blockages and provides location data for action. Using Wireless Sensor Networking (WSN) technology, sensor data is sent to a cloud for real-time monitoring, ensuring a healthy environment and preventing waterborne infections.

In his paper "Smart Drainage Monitoring and Controlling System Using IoT," published in 2021, Tushar Pathak proposes the use of IoT in a smart drainage monitoring and controlling system to automate the maintenance of urban subsurface drainage systems. Its goal is to continuously monitor water levels, obstacles, air temperature,

hazardous gas concentrations, and water flow rates. The drainage system is meant to sense obstructions and overflow, so it has the ability to automatically clear clogs. Among the objectives are smarter drainage management, affordable infrastructure management, real-time environmental condition updates, and cleaner cities.

Raakeshvarshan S., "Smart Real-Time Sewage Monitoring System Using Iot," (2022).The study recommends a Smart Real-Time Sewage Monitoring System that is based on the Internet of Things to track and fix problems with sewage outlet systems, particularly blockages that could result in overflows. The system uses a variety of sensors, including gas sensors to keep an eye on gas leaks and levels, door magnetic sensors to close the lid automatically, and ultrasonic sensors to find obstacles. These sensors use an Arduino Uno ATmega328P chip to wirelessly transfer data to a server or client so that quick action can be taken. The system is perfect for enhancing sewage management and reducing the risk to manual scavengers because of its low cost, ease of maintenance, and capacity to send emails or messages when thresholds are exceeded.

Rohit Shende, "Case Study Of Smart Real-Time Drainage Monitoring System," 2020.The study proposes a novel Wireless Sensor Network (WSN)-based real-time drainage monitoring system for big cities. It searches for obstructions between manholes, hazardous gasses, and rising water levels. The system is made up of Arduino microcontrollers, flow sensors, gas sensors, and NRF communication modules. Authorities can respond quickly thanks to this configuration, which improves worker safety and system maintenance by providing real-time information.

Aditya Patel, "IoT-Based Drainage Monitoring System" (2020). This study employs a network of interconnected sensors to create a real-time alerting system for monitoring subsurface drainage and manholes in urban areas. It includes a notification system to alert government authorities about obstructions, leaks, or high water levels, as well as sensors to monitor temperature and hazardous sewage gasses to provide cleaners with safe working conditions and safety measures.

Vaibhav Thate, "Smart Drainage System," (2021).In order to improve city cleanliness and safety, this paper proposes a "Smart Drainage System" that monitors the subsurface drainage system. Using a range of sensors, including temperature sensors, gas sensors for the detection of hazardous gases, and ultrasonic sensors for blockage detection, it continuously assesses the state of the drainage system. By alerting local authorities ahead of time to obstacles and other issues, the technology allows for timely intervention. This concept is particularly appropriate for smart cities and urban areas as it attempts to increase the efficiency and dependability of drainage system management.

Samiha Sultana, "An Iot Based Smart Drain Monitoring System With Alert Messages," (2021).This study proposes a smart drain monitoring system with an alert system that is based on the Internet of Things. It uses water level sensors to monitor water flow, an ultrasonic sensor to gauge the distance between sewage and water, and sensors such as the MQ135 to detect sewer gas. When thresholds are crossed, it locates itself using GPS and texts the relevant areas to authorities via GSM, alerting them to the situation. Furthermore, real-time data access is made possible by an online website powered by NodeMCU, allowing officials and the general public to monitor the situation. The system aims to provide real-time data and alert authorities promptly in order to promote community health.

G. Chandhini, "Iot Based Underground Drainage Monitoring System," 2020.The article suggests an Internet of Things-based subterranean drainage monitoring system to monitor harmful gases in sewage and alert manual scavengers when gas levels exceed predefined thresholds. The Node MCU functions as both the system's internet link and central controller, and it employs six sensors to identify gases. Pollution worker deaths can be prevented by turning on mobile pollution monitoring and displaying the system's outputs through a smartphone app.

"Iot Based Underground Drainage Monitoring System," M. Pavithra (2022).The report recommends an ingenious Internet of Things-based system for monitoring drainage water levels and obstructions in order to keep the city clean. The data is collected by sensors and sent to a Raspberry Pi3 controller. Based on the controller's output, the drainage water level, gas, and humidity levels are graphically displayed on an LCD screen and a web page, respectively. The device also sounds an alarm when the water level rises above a pre-set threshold. This technology provides real-time services and amenities to improve the growth and management of cities.

"Smart Real-Time Drainage Monitoring System Using Internet of Things," by Gaurang Sonawane (2020).The study suggests a clever real-time drainage monitoring system that makes use of a variety of sensors, including gas, obstruction, and water level sensors. The system's objectives are to improve flood detection in the early stages, monitor dangerous gas concentrations for worker safety, and identify obstructions in sewer lines to generate early cleaning alerts. With the aim of maintaining the city safe, clean, and healthy as well as minimizing manual drainage monitoring for the protection of sewer workers, it makes use of Wireless Sensor Networking (WSN) technology to gather and send data to a cloud for real-time monitoring.

Bhanujyothi, "Cloud-based smart system for managing and monitoring drainage using IoT," 2020.This paper proposes a cloud-based smart drainage monitoring framework that uses the Internet of Things (IoT) to monitor drainage systems autonomously. It monitors water flow rates and detects potentially hazardous gases using sensors. When sensors detect values that are higher than the threshold, they record and examine the data in the cloud. A buzzer is activated to indicate the need for prompt action when an alert from the Blynk server is sent via SMS to the municipal office. The system aims to improve management of urban drainage systems and mitigate issues faced by residents residing in close proximity to drainage systems.

IoT-Powered Intelligent Waste Management System featuring GSM and WiFi Module Tiwari Priya (2021).The article proposes an Internet of Things (IoT)-based smart sewage monitoring system that uses sensors and communication modules to identify temperature, stink gas, and clogs in sewage systems. Ultrasonic sensors monitor water levels, an LM35 temperature sensor measures the temperature inside manholes, and a MQ-2 gas sensor detects potentially hazardous gases. The system transfers data to the cloud for graphical representation and uses GSM to send alerts to a registered cellphone number. Its objectives are to make subterranean systems run more smoothly, protect sewage workers from harm, and provide a cost- and time-effective, human-free solution.

Parameshachari Bd, "Intelligent Human Free Sewage Alerting and Monitoring System," (2021).The report recommends an automated Internet of Things (IoT) system for the Underground Drainage Monitoring System (UDMS) of developing countries. Through the use of sensor networks, it automatically detects and updates physical attributes like temperature, water level, humidity, flow rate, and obstruction. The system can be tailored for environmental monitoring, including the detection of floods and volcanic activity, and it can be extended to agricultural areas or other environmental applications. Some of the features of the sensor network are the platform structure, compliance, renewability, improvements to sensor nodes and interactions, errors in interactions and functions, service availability for a variety of needs, and user server dependability in relation to IoT applications.

Dr. Gunasekaran M., "Iot-Enabled Underground Drainage Monitoring System Using Water Flow Sensor," (2021).The study proposes the use of a water flow sensor to develop a subsurface drainage monitoring system with Internet of Things capabilities. The Internet of Things (IoT) is updated by this system using an Arduino, water flow sensors, and GSM technology, enabling real-time administration and monitoring of underground systems. It is meant to help locate blockages in the drainage system, reduce water waste, and prevent diseases caused by contaminated water. Technology helps to maintain a risk-free and well-maintained drainage system by enabling real-time updates via the web.

Smart Cities: IoT-Powered Waste Management and Drainage Monitoring and Alert System, Aarthi M (2021).The study recommends a system consisting of an ultrasonic sensor, a gas sensor, and a surface sensor to remotely monitor drainage depth, gas level, and temperature. Its objective is to create self-sufficient, affordable wastewater and waste management systems using the Internet of Things (IoT). The system includes cloud storage for the GPS sensor node, a network coordinator, and an improved graphical user interface for remote access. The sensor node facilitates smart system applications by collecting physical parameter readings and sending the data via the Blynk server.

METHODOLOGY

Manholes are placed over the drainage channels to allow for operation and the removal of internal blockages. The sensor node is installed inside the manhole, where it gathers and transmits the necessary sensed data regarding the obstruction, hazardous gases, and environmental factors to identify increased drainage system flow levels. It will communicate with the sensor nodes located at neighbouring manholes via the communication modules. After that, this data will be sent to the base

station for additional examination. Real-time scenario monitoring of the water levels, drainage blockages, and quantity of hazardous gases will be conducted by sensors. The location ID and data values provided by the drainage system's sensors will be used to provide the relevant authorities with information.

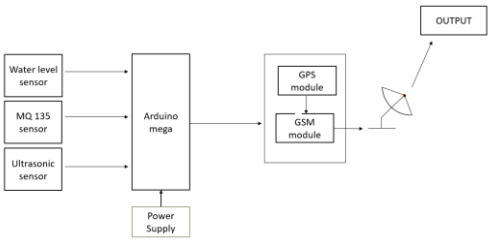


FIG 1: BLOCK DIAGRAM

In the block diagram we can see the different sensors being interfaced with the Arduino Mega board. The water level sensor, MQ 135 sensor and ultrasonic sensor is interfaced to the Arduino Mega. The Arduino mega board is powered by a power supply which also powers the water level sensor, MQ135 sensor and ultrasonic sensor.

The water level sensor is a device that measures the liquid level in a fixed container that is too high or too low. The input type water level transmitter we call is a contact measurement, which converts the height of the liquid level into an electrical signal for output. It is currently a widely used water level transmitter. The water level sensor is used to measure the water flow inside the drainage pipes and the same will be shown as output using the Arduino mega board. The values from the water level sensor will be sent to the Arduino mega and the values will be sent to the concerned authorities.

The MQ135 sensor is used to sense the harmful gases that might be present in the water flowing through the pipes. The MQ-135 sensor stands as a valiant soldier in the fight for clean air. It's an electrochemical marvel, adept at detecting the presence of various gases, particularly volatile organic compounds (VOCs) and inorganic gases like ammonia (NH3), ethanol (C2H5OH), and benzene (C6H6). The values of the gas sensor will be sent to the Arduino mega board and the values will be continuously monitored and sent to the concerned authorities.

The third component used is the ultra-sonic sensor which is responsible for verifying the water flow in the pipes. It not only checks the water flow but also checks the presence of any cracks in the pipes. Ultrasonic sensors, the workhorses of many robotic and industrial applications, operate on a fascinating principle. They utilize sound waves beyond the human audible range (ultrasonic) to measure distance, detect objects, and navigate environments. This technology offers a robust and versatile solution for various sensing needs. The values from the ultra-sonic sensor will be fed to Arduino mega board where it will be monitored for any discrepancies.

The values from the 3 sensors (water level sensor, MQ135 and ultra-sonic sensor) are collected and sent to the Arduino mega. In Arduino mega the program is dumped where the conditions are set. The values are then compared with the values that are dumped in the program and if the values from the sensor exceed the threshold values, then an alert will be given to the authorities along with the location as well as the values. The difference in the values maybe due to any blockages or any cracks in the pipes. This may result

The values will be sent to the authorities using the GSM module and the location of the blockage will be sent using the GPS module.

The fourth component used is the GSM module which is responsible for sending the message to the authorities the message includes the water level values, the gas sensor values and the location of the blockages which is received from the GPS module. This module has two antennas included. First is made of wire (which solders directly to NET pin on PCB) - very useful in narrow places. Second - PCB antenna - with double sided tape and attached pigtail cable with IPX connector. This one has better performance and allows to put your module inside a metal case - as long the antenna is outside.

The final component used is the GPS module which is responsible for sending the location of the blockage to the authorities. The GPS module used is GPS Neo 6m module. the NEO-6M GPS module that can track 22 satellites and identify locations anywhere in the world. It can serve as a great launch pad for anyone looking to get into the world of GPS.

All these are responsible for transmitting the required information to the authorities. This can be concluded by the following flowchart.

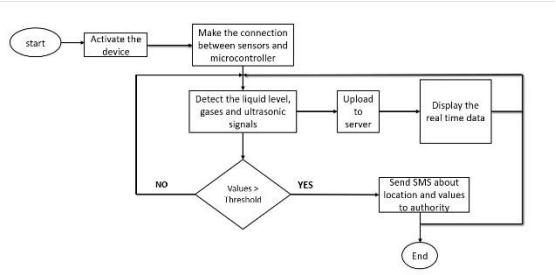


FIG 2: FLOWCHART

Above shows the flowchart for our project.

Initially we switch on the device and wait for it to power on. This activates the device and we make the required conditions between sensors and microcontroller. This turns on the sensors and sensor start taking the values. These values are continuously monitored and checked with the threshold values set in the program. These values are monitored to check if there are any discrepancies. If there is any unusual spike in the values then an alert will be sent to the authorities.

The data includes the data from the water level sensor, the gas sensor and GPS module which tells the position about the high values.

The sensors detect the liquid level, gases level and ultrasonic levels. The values from these sensors will be shown continuously on the IDE software. From the serial monitor of the Arduino IDE, we can continuously monitor the values for any sudden rise or fall in the values. If the authorities see any unexpected changes in the values, then it may be either due to any blockages or any leak.

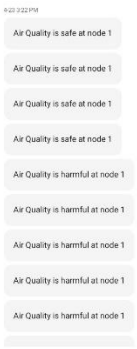
If the values from the sensors exceed the threshold, then a message will be sent by the authorities. The message will be in the form of SMS. The SMS will include the vales from the 3 sensors. Along with the values, there will also be the location of the place where the blockage or leak is present. The location will be sent using the GPS module and the SMS will be sent by the GSM module.

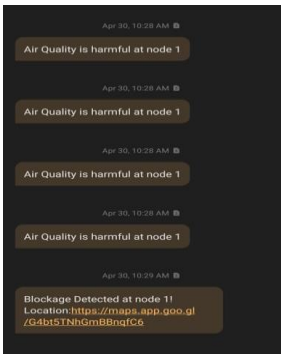
The values at the same time will be continuously monitored and it keeps on checking the values for any further changes. This way the flowchart operates and the way in which the values are monitored, and the way in which the values are informed to the concerned authorities.

RESULTS

The above picture represents our final working project.

When there is a blockage detected in the pipes a SMS will be sent to the number which is uploaded in the program. The message includes the node where the blockage is detected and the concentration of gases in the node. Also, with the GPS module, the location of the blockage can also be sent. This is shown in the 2 pictures that are attached below.





REFERENCES

1. Hemamalini M, PUVANESHWARI S (April 2022), Smart Real Time Drainage Monitoring System Using IOT.

2. Tushar Pathak, Sanyogita Deshmukh, Pooja Reddy, Prof H. P. Rewatkar, Smart Drainage Monitoring and Controlling System Using Iot, International Journal of Research in Engineering and Science (IJRES) (2021).

3. Raakeshvarshan S, Dr. R Rajalakshmi, Smart Real Time Sewage Monitoring System Using Iot, Smart Real Time Drainage Monitoring System Using Iot, Volume 13, Issue 4, April 2022.

4. Rohit Shende, Anjali Sangode, Vaishnavi

Kalbande, Minal Bhambore, Rajendra Khule, Case Study of Smart Real Time Drainage Monitoring System International Journal Of Research In Engineering, Science And Management Volume-3, Issue-2, February-2020.

5. Aditya Patel, Parth Dave, Aatish Patel ,Drainage Monitoring System Using IoT , International Journal for Research in Engineering Application & Management (IJREAM) ISSN : 2454-9150 Vol-06, Issue-08, NOV 2020 .

6. Vaibhav Thate, Pratik Thorat Shubham Kharjule Amol Gite Prof. N.D.Kapale SMART DRAINAGE SYSTEM International Research Journal of Modernization in Engineering Technology and Science Volume: 03/Issue: 06/June-2021.

7. Samiha Sultana, Ananya Rahaman, Anita Mahmud Jhara, Akash Chandra Paul, Jia Uddin, An IOT based Smart Drain Monitoring System with Alert Messages, February 2021

8. G Chandhini, B Chithra, P Kiruthikadevi, Bhagya Sasi, V. Kamal Kumar, IoT Based Underground Drainage Monitoring System, International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878 (Online), Volume-9 Issue-3 September 2020

9. Pavithra M, Gowtham P K, Jignesh M, Jayasubha K, JeevithaBrindha A, IoT BASED UNDERGROUND DRAINAGE MONITORING SYSTEM, Volume 10, Issue 5 May 2022 ISSN: 2320-2882, 2022 IJCRT

10. GAURANG SONAWANE , CHETAN MAHAJAN , ANUJA NIKALE , YOGITA DALVI, Smart Real-Time Drainage Monitoring System Using Internet of Things, IRE Journals Volume 1 Issue 11 ISSN: 2456-8880, MAY 2018

11. Bhanujyothi H C, Dr. I Jeena Jacob , Vidya J , Sahana D S, Praveen Kumar K C, Cloud Based Smart System for Monitoring and Managing Drainage using IoT International Journal of Advanced Trends in Computer Science and Engineering, Volume 9, No.5, September - October 2020

12. Priya Tiwari, IoT Based Smart Sewage Monitoring System using GSM and Wi-Fi Module, International Journal of Innovative Science and Research Technology ISSN No:-2456-2165, Volume 6, Issue 5, May – 2021

13. Parameshachari B D1, Keerthi Kumar M1, Kruthika T R1, Melvina Aranha1, Pallavi R1, Poonam K S Intelligent Human Free Sewage Alerting And Monitoring System Atlantis Highlights In Computer Sciences, Volume 4, 2021.

14. Dr. Gunasekaran M, Pavithra S, Priyanka R, Reeva M, IOT-ENABLED UNDERGROUND DRAINAGE MONITORING SYSTEM USING WATER FLOW SENSOR, International Research Journal of Engineering and Technology (IRJET), Volume: 06 Issue: 03 | Mar 2019

15. Aarthi M, Bhuvaneshwaran A, Iot Based Drainage and Waste Management Monitoring and Alert System for Smart City, Annals of R.S.C.B., ISSN: 1583-6258, Vol. 25, Issue 3, 2021, and Pages. 6641 – 6651, March 2021