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Early Warning System To Detect Sewage Blocks And Hazardous Gases Using Iot

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Abstract: **Sewer flooding incidents are increasingly associated with the presence of blockages. Blockages are difficult to deal with as although there are locations where they are more likely to occur, they do occur intermittently. In order to manage sewer blockage proactively sewer managers need to be able to identify the location of blockages promptly. Although drainage cleaning people are not aware of risk by sudden attack of poisonous gas since the gases are odorless, if exposed for long time which may cause serious health problems. Due to lack gas leakage detection system, a number of dangerous accidents occurred during the last few last decades. This main objective of this proposed system is to implement an underground drainage monitoring system using IoT for low cost. It requires low maintenance, fast deployment, provide long life time and high quality of service.**

Index Terms **- Internet of Things, Hazardous Gas Sensor, Sewage Monitoring.**

I. INTRODUCTION

Today's society needs modern advances in the field of planning. Sewage workers continue to lose their lives from inhaling toxic gases inside manholes. This also proves improper monitoring of the sewer system. In this proposed system, we aim to provide a cost-effective, economical, and flexible alternative to detect blockages, unpleasant odors, and hazardous gases. Ultrasonic sensors measure the water level, and if the difference between the water level and the threshold value is greater than the threshold value, an alert message is sent to the person in charge. The output of the sensors is interfaced with the Arduino Uno. It checks the threshold level which is already set and sends an alert message through GSM to the person in charge and this is monitored using IoT. The best outcome of this system is that it can avoid the deaths of sewage workers due to exposure to harmful gases.

II. LITERATURE SURVEY

[1] Sudhanshu Kumar's (2019) real-time health monitoring device will work in sewage as safety equipment. In this paper, the device presented will monitor the pulse rate of a person using a pulse oximetry sensor, the methane concentration, and the atmospheric oxygen concentration and provide alerts to the worker and exterior unit.

[2] R. Girisrinivaas and V. Parthipan (2017) Drainage overflow monitoring system using IoT (DOMS). Their proposed system will monitor the water level and gas level in the sewage system and the measured values will be stored in the cloud storage and then analyzed and the sewage system condition will be sent to the corporate office as SMS using the GSM module.

[3] Geng Chen and Le Wang (2017) Aimed at the real-time monitoring of Sewage in the service area. This paper presents a sewage quality monitoring system based on ZigBee wireless sensor network. Secondly, this paper proposes a weighted average fusion algorithm, which can obtain accurate fusion of air parameters.

III. PROPOSED SYSTEM

The proposed system provides a methodology to check the harmful release of gaseous materials in areas included in the drainage system, social housing, and industrial facilities. Sewage also contributes to the natural process of producing poisonous gases. Drainage systems releases hazardous gases such as sulfur dioxide, methane, ammonia, nitrogen dioxide, carbon dioxide, and carbon monoxide, etc. Therefore, these toxic gases sometimes lead to their death, particularly for sewage workers and cleaners. Hence, an IoT-based monitoring system is being introduced to avoid exposure to such workplace hazards. Using the latest design, the drawbacks of the current system will be addressed. In addition to the gas sensors, the humidity and temperature sensors can also be added to assess the overall environment of the sewage.

OBJECTIVE:

The main objective of the proposed system is,

- To provide automatic detection of sewage blocks.
- To track the location of the presence of toxic gas and send quick alert messages via SMS.
- To view the details of Sewage monitoring system using Mobile application.

WORKING PRINCIPLE:

The System consists of Arduino UNO Board, Power supply, LCD Display, Ultrasonic Sensor, Toxic gas detector, GSM Module, and a Buzzer. Ultrasonic sensors are used to detect the blockage frequently in the sewage tunnel. Various Gas Sensors (MQ3, MQ6, etc.) are used to detect the toxic gases in water. The presence of sewage block and toxic gas-related information from these sensors is received and processed in the Arduino UNO board and a push notification is sent to the mobile in case of Blockage or Overflow. The data collected from various sensors are sent to cloud storage for further processing. A suitable mobile application is developed to view the details of Sewage monitoring system from anywhere in the world.

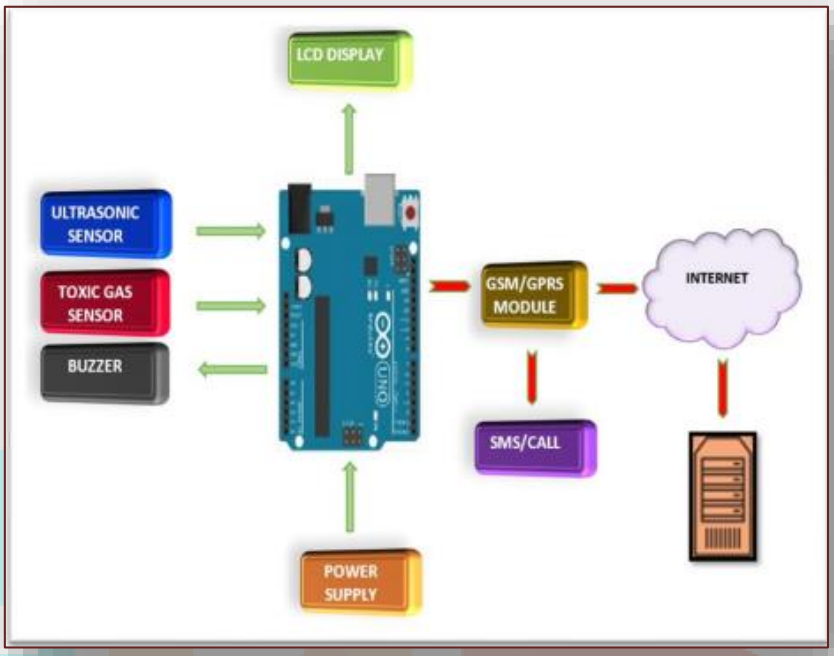

Fig.1- Block Diagram of Proposed system

ADVANTAGES:

- Easy to track the gas level and detect the sewage blocks at their initial stage.
- Long working life of the equipment
- Improved workers' security
- Effluent Regulatory Compliance and easy access to the Sewage Management Trend Data
- It is scalable and cost effective

IV.SYSTEM DESIGN AND IMPLEMENTATION

HARDWARE REQUIRED:

- **Arduino UNO**

  Arduino is an open-source electronics platform predicated on easy-to-use attacks and software. With its simple and accessible user experience, Arduino has been used in thousands of different systems and operations. The Arduino software is easy- to use for beginners, yet flexible enough for advanced stoners. It runs on Mac, Windows, and Linux.

- **GSM Module**

  GSM stands for Global System for Mobile communication it is used to send an alert message to the specified mobile number when the water level crosses a threshold value.

- **Toxic Gas Sensor**

Industrial toxic gas and oxygen gas detectors monitor the presence of gases in a specified area and sound an alarm when they reach dangerous levels. Gas detectors are typically installed where there is a potential for a gas leak, and where unsafe gas levels pose an immediate danger to workers or equipment.

- **Temperature Sensor**

  A temperature sensor is a device used to measure temperature. This can be air temperature, liquid temperature, or the temperature of solid matter.

- **LCD**

  LCD stands for Liquid Crystal Display it displays the data which comes from the Arduino UNO microcontroller.

SOFTWARE REQUIRED:

- **ThinkSpeak**
  ThinkSpeak is a real-time data processing and visualizing IoT platform, which visualizes our data sent from Arduino UNO to the ThinkSpeak channel.
- **Android Studio**
  Android Studio is the open-source SDK (Software Development Kit) used for developing android applications and android games.
- **Arduino IDE**
  It is open-source software, used to write and upload the code to the Arduino UNO microcontroller. The IDE application is suitable for many operating systems such as Windows, Mac OS X, and Linux.
- **Programming Languages:** Embedded C.

INTERFACING ARDUINO UNO WITH SENSORS:

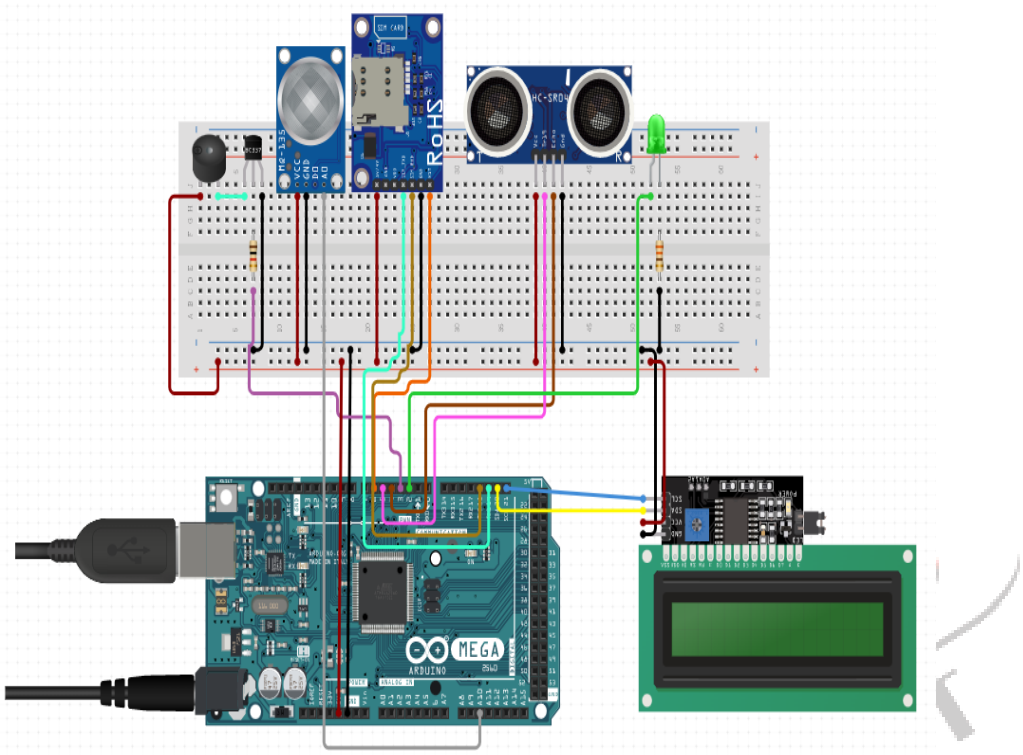

Fig.2-Interface Diagram

INTERFACING ULTRASONIC SENSOR TO ARDUINO UNO

STEP 1: Connect the Ultrasonic Sensor Vcc to 5V Power Supply on Arduino UNO.
STEP 2: Connect the Ultrasonic Sensor Trig to A2 Pin on Arduino UNO.
STEP 3: Connect the Ultrasonic Sensor Echo to A3 Pin on Arduino UNO.
STEP 4: Connect the Ultrasonic Sensor GND to GND on Arduino UNO

INTERFACING MQ2 GAS SENSOR TO ARDUINO

STEP 1: Connect the MQ2 Gas sensor module to the Arduino.
STEP2: Connect the VCC pin to the Arduino's 5V Pin.
STEP 3: The GND pin to the Arduino's ground pin.

INTERFACING GSM MODULE TO ARDUINO

STEP 1: Connect the module's D0 output pin to Digital pin #8 on the Arduino.
STEP 2: The module's A0 output pin to Analog pin #0 on the Arduino.

DATA FLOW DIAGRAM:

A data-flow diagram (DFD) is a way of representing a flow of data through a process or a System. The following DFD also provides information about the outputs and inputs of each entity and the process itself.

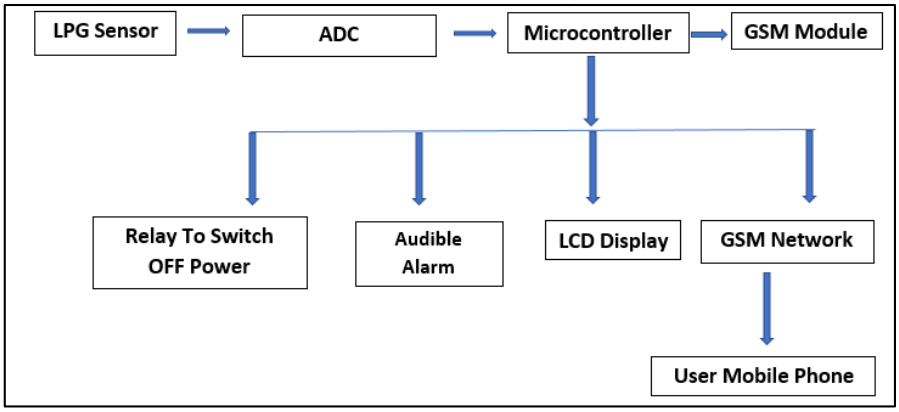

Fig.3-Data Flow Diagram

THINGSPEAK

ThingSpeak is open-source Ruby software that allows users to communicate with internet-enabled devices. It enables data access, retrieval, and logging by providing an API to both devices and social network websites. ThingSpeak was originally launched in 2010 by ioBridge as a service to support IoT applications. ThingSpeak provides real-time visualizations of data posted to ThingSpeak by your devices. With the ability to execute MATLAB® code in ThingSpeak, you can perform real-time data analysis and processing. ThingSpeak is frequently used for IoT system prototyping and proof of concept.

The ThingSpeak supports up to 8 data fields, you might want to send more than one value to ThingSpeak. if you want to send multiple values to ThingSpeak from an Arduino, you use ThingSpeak.setField (#, value) for each value to send and then use ThingSpeak.writeFields(myChannelNumber, myWriteAPIKey) to send everything to ThingSpeak

V.RESULT

STEP 1:

Arduino UNO board is interfaced with MQ2 Gas Sensor, Ultrasonic, and LCD. The connection of Sensors with Arduino is shown in Fig.4. When the kit is initialized, it will display the welcome message as in Fig

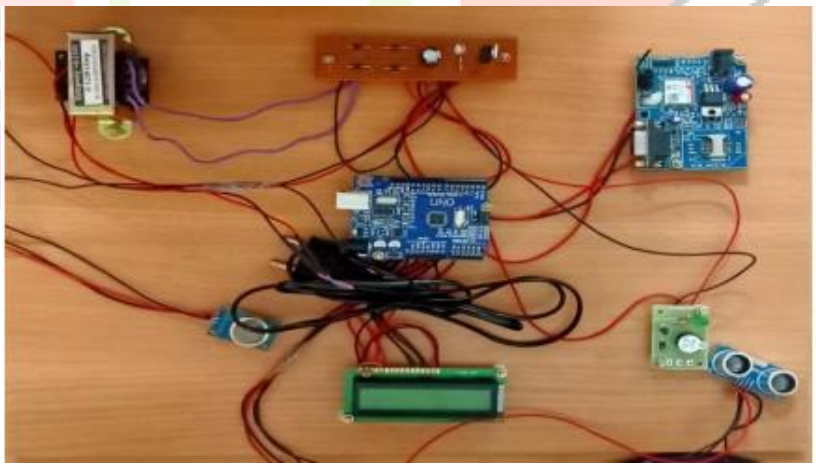

Fig. 4-Arduino with Sensors

Fig.5- Welcome Message

STEP 2:

The MQ2 Gas sensor is exposed to Hand sanitizer in Prototype as shown in fig.6

Fig-:6. Detecting Hazardous gas using an MQ2 sensor

STEP 3:

When the Gas Sensor detects the hazardous Gas, it sends a signal to Arduino, and then the Arduino activates the buzzer and glows the LED as shown in Fig.7 .An alert message is also displayed on the LCD as shown in Fig.8.

Fig-:7. Buzzer and LED Indication

Fig-:8. An alert message displayed on the LCD

STEP 4:

The location of the Sewage blockage can be viewed as shown in Fig.9. on the mobile phone by clicking the link received through SMS.

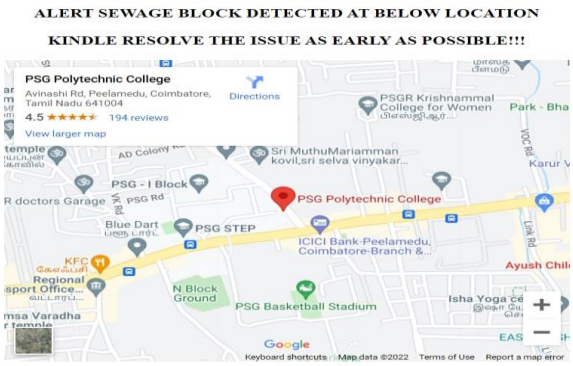

Fig-:9. Block Detection with Location

STEP 5:

The GSM module sends the Sewage level data to ThingSpeak cloud and plotted it to a graph as shown in Fig.10.

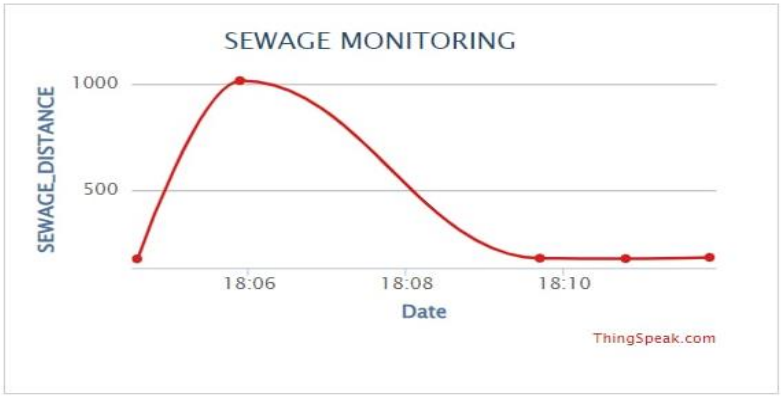

Fig-:10. Graph of Sewage Block

V. ACKNOWLEDGEMENT

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VI. CONCLUSION

The proposed system describes a situation where sensors exchange data with each other to make smart decisions and help concerned authorities to monitor and manage daily routines as effectively as possible. One more benefit that will ensure we employ the internet of things technology is the increase in energy efficiency. With large-scale implementation, thoughtful deployment, and careful management, IoT based Sewage block detection and Hazardous gas detection system can transform our living spaces into smart and sustainable spaces. In future , ML based algorithms can be implemented to analyze the real time data and predict the sewage blocks and accumulation of hazardous gases at earlier stages and ensure that sanitary workers lives are safer and more convenient than ever before.

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