DEVELOPMENT OF MANHOLE COVER DETECTION AND CONTINUOUS MONITORING OF HAZARDOUS GASES USING WSN AND IOT

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ABSTRACT

This paper presents an essential manhole monitoring and detecting system, where the continuous monitoring of hazardous gases, condition of manhole lid using different sensors. The continuous monitoring of the gas levels and lid open condition are captured by the sensing unit and the sensor data are transferred to Atmega 328p microcontroller unit. The processed data will be stored in the cloud for further processing also sent it to the host station using the long-distance communication LoRa module. According to the received data an alert will be provided to the public regarding the manhole cover condition. The design goal of our system is low cost, low maintenance, implementable, also overflowing of the gully pot system, water contamination, and leakage of dangerous gases and blockage of manholes are detected and the information is sent to the concerned authorities using Wireless Sensor Networks (WSNs) and Internet of Things. The gas levels in the sewage system exceeds the threshold value, the corporation people can take proper measures and appropriate action to maintain the manhole.

INTRODUCTION

In many developing countries manholes are not monitored properly, but for the public safety and security the manhole system should be managed in good condition. Continuous monitoring of manholes is important one in smart city implementation. In the present scenario smart cities doesn't only mean smart traffic lights, smart framing, etc. It must also include smart manhole system. Continuous monitoring of sewage gases present in the system is more important in every smart city implementation. Comparing with other countries India is overwhelmed with population and sewages. Also, most of the manhole lids are open and not in proper condition. Due to the improper maintenance of gully pot systems, emission of poisonous gases affects the workers, which leads to losing of their lives and even more causes dangerous disease which can easily spread. This paper presents an essential manhole monitoring and detecting system, where the continuous monitoring of hazardous gases, condition of manhole lid using different sensors. The continuous monitoring of the gas levels and lid open condition are captured by the sensing unit and the sensor data are transferred to Atmega 328p microcontroller unit. The processed data will be stored in the cloud for further processing also sent it to the host station using the long-distance communication LoRa module.

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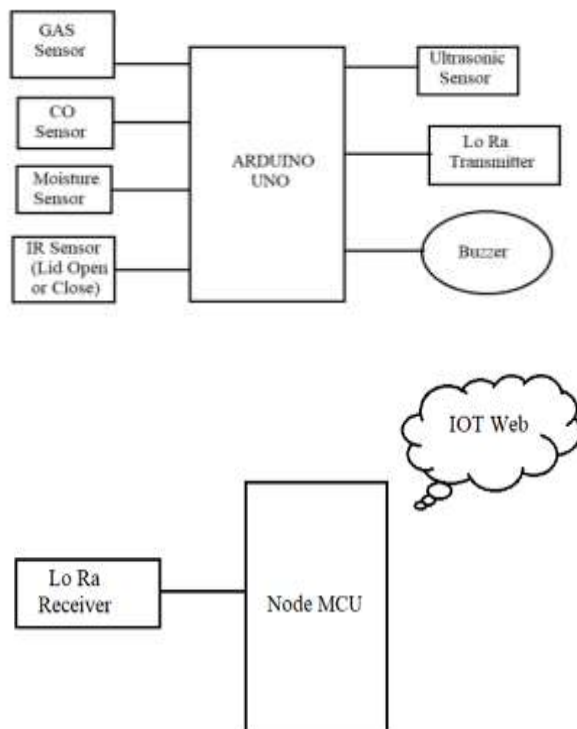

Fig.1: Block Diagram

PROPOSED SYSTEM

The aim of this project is to design and implement a system for the Development of Manhole Cover detection and continuous monitoring of hazardous gases using WSN and IOT. The proposed system involves real-time monitoring of manhole systems. The various sensors like Gas sensor, CO sensor, IR sensor, moisture sensor, Ultrasonic sensor and a zigbee transmitter along with a buzzer are interfaced with ARDUINO UNO. The Gas sensor is connected to A1 pin of Arduino. The echo and trigger pin of ultrasonic sensor is connected to D6 and D7 pin of Arduino. The CO sensor is connected to A0 pin of Arduino. The IR sensor is connected to D5, moisture sensor is connected to A2 and buzzer is connected to D13 pin of Arduino board. Apart from these a zigbee receiver is connected to NODE-MCU.

The Gas sensor is used to detect the natural gases like methane, ethane , etc. Whenever the detected value exceeds the threshold value 100 ppm, then the buzzer gives a loud beep sound. The CO sensor is used to detect toxic Carbon Monoxide gas specifically and if the sensed value is greater than threshold 100ppm,then buzzer will be activated. Soil moisture sensor is used to detect the moisture present in the manhole by detecting its condition whether it is wet or dry. As soon as the moisture level exceeds threshold value 500, buzzer gets activated. Ultrasonic sensor detects the distance of water from the lid cover which is nothing but it gives the

water level value. Upon exceeding threshold value 20, buzzer will release the sound.
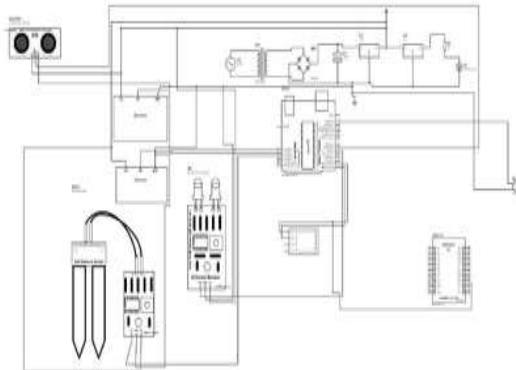
CIRCUIT DIAGRAM

Fig.2: SCHEM ATIC DIAGRAM

IR sensor allows us to detect the physical condition of the manhole cover lid. If the sensor detects any object around its surroundings it becomes '0' and it can be considered as the lid is closed and buzzer will not gets activated. But if the sensor couldn't detect or sense any object then it becomes '1' which can be considered as the lid id open. And whenever the lid is in open condition the buzzer will be in active state continuously until it gets closed.
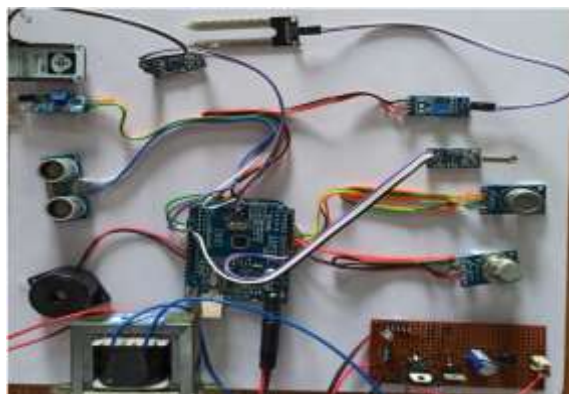

Fig.3: Photocopy of Project

All these sensed data will be processed by Arduino and transmitted by using zigbee transmitter. The transmitted data gets received by zigbee receiver and is sent to Node MCU which is also a microcontroller. The inbuilt WIFI module present in Node MCU allows us to update the sensor data in the blynk app by using internet.

CONCLUSION

Thus the "DEVELOPMENT OF MANHOLE COVER DETECTION AND CONTINUOUS MONITORING OF HAZARDOUS GASES USING WSN AND IOT" has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. The system has been tested to function automatically. Arduino collects and process the data detected by Various sensors like gas sensor, ultrasonic sensor, moisture sensor, IR sensor and CO sensor which are connected to Arduino along with a HC-12 transmitter and a buzzer. The processed data from Arduino is transmitted to HC-12 receiver through HC-12 transmitter. The received data is uploaded into IOT web or cloud using a wireless sensor network and Node MCU which has an inbuilt WIFI module. Thus, the functionality of the entire system has been tested thoroughly and it is said to function successfully.

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