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Underground drainage and ManholeMonitoring System

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***Abstract*:** A smart city is the future goal to have clean and better amenities for society. For making a smart city, one needs to consider many parameters. One of the parameters is the sewer system. A Drainage Monitoring System Plays a significant role in keeping towns andcities healthy and clean. The majority of manholes are open and free from obstructions that could lead to mishaps. All the man-holes don't seem to be in a secure position. Many man-holes are in broken condition. With these broken man-holes, there probability of the occurrence of accidents on the roads. The Sewage System must be monitored in order to keep the city clean. Uneven Sewage System monitoring causes drainage to become clogged. Many cities in India have adopted underground drainage systems, it is very important that the system should work in a proper manner to keep the city clean, safe and healthy. So, an idea is proposed for monitoring and managing the underground drainage and manhole monitoring system. Most of the underground drainage management system is done manually. It is not efficient in big cities; it is difficult to locate the exact manhole which is facing the problem. The main aim is to develop a system which can handle underground sewers without human interference. The Underground drainage system includes a gas pipeline network, a water pipeline and manholes. The proposed system is designed which is able to monitor the sewerage level, temperature, toxic gases in the sewerage system and the presence of manhole cover.

Keywords: Temperature, Gas, Water overflow, Manhole cover monitoring

I . INTRODUCTION

An integral part of any drainage system is the access points to 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 in drains during the monsoon season causes problems in the routine of the public. Today's drainage system is not high-tech. So, whenever there is a blockage, it is difficult to figure out the exact location of the blockage. Moreover, no early warnings of the obstruction are received. Hence, detection and repairing of the blockage has become time-consuming. It becomes very inconvenient to handle the situation when pipes are blocked completely. Due to such failure of a drainage line, people face a lot of problems. Hence, there should be a facility in the city's corporation which alerts the officials about blockages in sewers and gas explosion, and increase in the water level and the temperature level.

II LITERATURE SURVEY

The basic project idea is to design an underground drainage overflow detection system which would automatically notify the current status of drainage water level in various underground manholes in the city. In this system, the sensornode consists of four parts: GSM (Global system for mobile communication) Module as a transceiver, Arduino as Microcontroller, sensor and battery. This sensor sends the data to the Arduino and, finally this real time data is sent to Municipal Corporation Mobile through GSM and displays the same on Cloud.

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Nodes are deployed as per manhole location. A node is identified by using its address so that any node sends the data that exceeds with normal reading is easily identified and counteraction will be taken by municipal council authorities. If reading is in the normal range, there is no need to take action .[1]

The network consists of GPS sensor nodes, network coordinator, and cloud storage. A remote graphical user interface is further developed to examine the information and analysis results. Based on the proposed system architecture, sensor nodes respond to sample the physical parameters to levels of measurable voltage through corresponding sensors. The Blynk server is then used to transfer this acquired data to the organizer via a wireless connection. The coordinator is focusing on constellation maintenance, collecting data and transferring the reassembled information to the cloud storage using Wi-Fi through the mobile internet. Open WSN Cloud data storage platform Blynk is custom made for this work. The Blynk platform offers flexible data assortment and visual image. Therefore, with no difficulty, the support of huge number of sensor data and GPS locations are streamed and viewed. Various types of sensors (Ultrasonic, temperature and gas sensors) are interfaced with Arduino UNO in order to make the system smart. The controller receives the indication of that specific value and sensor when the corresponding sensors hit the threshold level. Additionally, Arduino Uno uses GSM and GPS to communicate the signal and position of the manhole to the municipal corporation so that staff members can quickly identify the problematic manhole and take the necessary action. Additionally, using IoT, the Arduino Uno updates the real-time values of all the sensors in the manholes located within the designated region. The LCD will be used to show messages. [2]

The major objectives of the paper are listed.
Smart and Clean cities by efficient management system Continuous detection of drainage water level and blockages in the sewer lines Monitor water flow rate continuously, as well as sending automatic mail, display on the LCD to obtain a low-cost is the main objective and flexible solution for monitoring with a good ndition.

Smart Sensors and ARM based Drainage monitoring system implantation is discussed in the paper. The core unit of this system is ARM7.

The ARM7 processor is configured to detect the blockage and amount of sewage water. Attached gas sensors give the early report if any gas leakage by alert message or sound by buzzers. This paper describes about smart solutions using sensors and ARM7.When the sensors reach their threshold value then their values are displayed on the LCD display. When the gas is detected, it is displayed on the LCD as well a text message is to the registered number through GSM. The same process is revised when the water level is high. The flow of the waste water can be continuously monitored on the think speak website.

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Different types of sensors like flow, level and gas detecting sensors interfaced with the microcontroller ARM7 system. Particular sensors reach the threshold values and then the information of that respective sensor is sent to the microcontroller that is ARM7. Further, based on the input received from the different sensors, ARM7 then sends the signal and location of the blocked location of the water channel to the municipal corporation and the officials through GSM could easily locate which blocked channel and could take appropriate steps. Sensors which interfaced in different ports are selected by programming ARM7 and updates the live values of all sensors to the web server using IOT. The entire information regarding sensors will also be displayed on the 16*2 LCD. [3]

In the proposed system, various gas sensors inclusive of MQ4 (Methane sensor) and MQ7(Carbon Monoxide sensor) are used for

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detecting the presence of hazardous gases in sewage. The control of the setup present at different nodal locations is provided by a single receiver end. The output is transmitted via the GSM module to the cloud. Here we have used Things Speak IoT platform for this project. The Arduino UNO enables it to read sensor data such as the ppm values collected from the Methane sensor (MQ-4) and Carbon Mono oxide sensor (MQ-7) of the respective gases from waste and sewage. Further, these real time ppm values are simultaneously updated to the cloud using the Thing Speak IoT platform. The graphical representation of ppm values of these gases is plotted using the analytics tools in Thing Speak, Finally, the status or an alert is sent to the mobile of the user when the values reach the threshold value using the GSM module. The data of the ppm values of the sensors can be stored and monitored by the user. Arduino UNO as a microcontroller board. The simulation of sensors, Software-based SMS generation, and calling is done on this microcontroller. Thing Speak is an IoT platform that uses channels to store data sent from devices. Connecting the GSM Module to Arduino – Serial communication occurs between the Arduino and the GSM module. Connecting GSM Module to Thing Speak- Thing Speak is an IoT platform that uses channels to store data sent from devices. The MQTT Publish method can also be used to update a channel feed and MQTT Subscribe to receive messages whenever there is a channel update. Sending the readings to the Thing Speak server and analyzing graphs using MATLAB in Thing Speak. In the proposed design, it is used to take readings from sensors and upload the value of the ppm concentration of gas on the cloud using GSM, which uses HTTP protocol for updating. Further in the proposed design, the use of a software-based SMS module allows users to send/receive information over GPRS, send/receive short message services and make/receive voice calls. It communicates consecutively with devices like microcontrollers, PC using AT commands. On pressing the emergency button, the LED glows and sends a message to the concerned person. [4]

III PROPOSED SYSTEM

The Proposed system consists of temperature, gas, water overflow and tilt sensors. They are interfaced with ESP8266 and the result will be displayed on an LCD screen and Blynk app. Also, automatic open or close of manhole cover can be done. This system alerts the municipal officials.

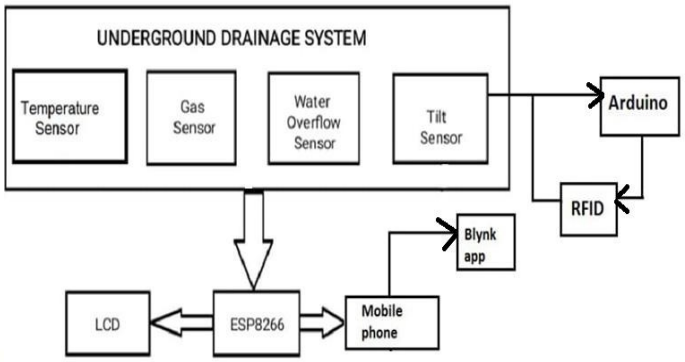

Fig 1: Proposed system

IV METHODOLOGY

Smart cities are the places where we have maximum population. The urban area management issues are: population, pollution, poverty, security and mobility. To maintain the basis of the smart cities, which are underground systems, they should be managed properly. The proposed IoT-based IMCS should be implemented in the manholes to manage the drainage system efficiently. Every manhole cover in the system had three states.

Stage 1: The manhole is attached with sensors (temperature, gas, water overflow). Each of the sensors can detect the variations in the drainage system. ESP8266 is used to take inputs from the sensors and convert them into output. It is connected to Blynk app via WIFI to monitor the data and alert the officials. Values of sensors are displayed on LCD.

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Stage 2: Input from the tilt sensor is taken by the Arduino and data will be processed. By scanning the RFID card, manhole cover can be automatically opened and closed. The Status of tilt sensor can be displayed on Blynk app.

Stage 3: The Location of drainage system which is facing problems can be shared with municipal officers.

V RESULTS

Fig 2: Testing of gas sensor and output is displayed in Blynk app, LCD

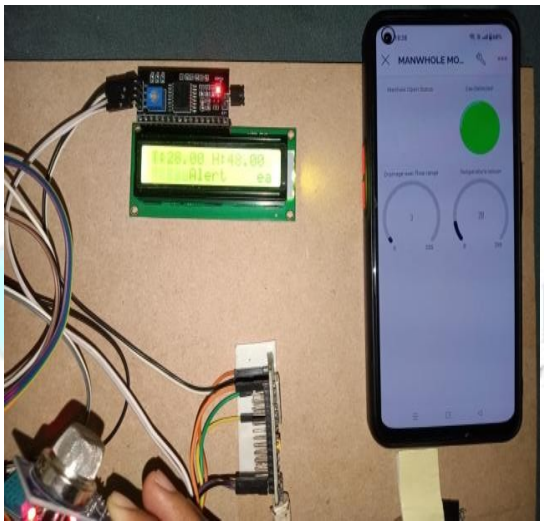


Fig 3: Testing of water overflow sensor and output isdisplayed in Blynk app.

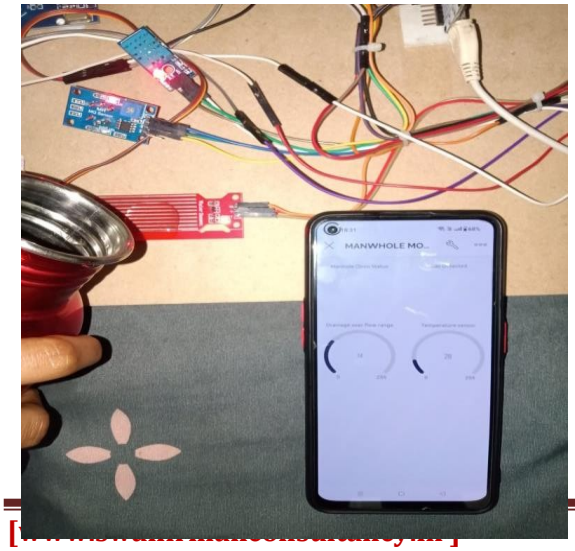
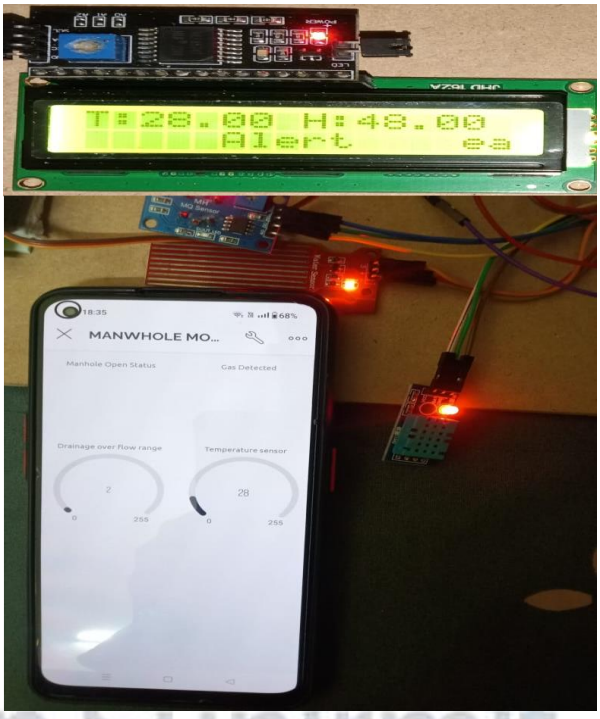


Fig 4: Testing of temperature sensor and output is displayed in Blynk app, LCD



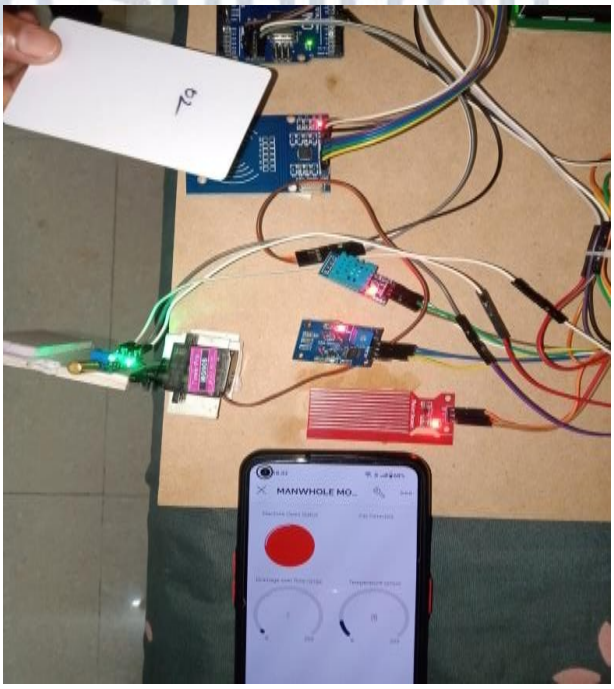


Fig 5: When RFID card is scanned, manhole cover isautomatically opened and output is displayed in Blynk app.

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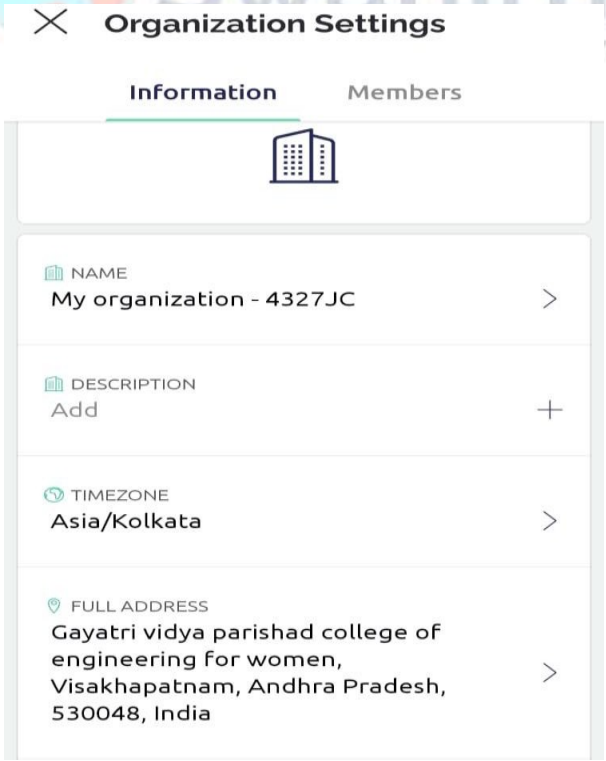
Fig 6: When RFID card is again scanned, manhole coveris automatically closed and output is displayed in Blynk app

Fig 7: Location of the manhole



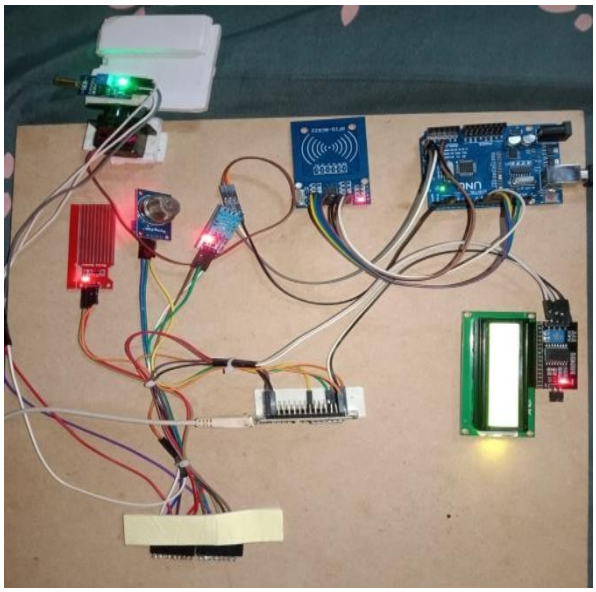


Fig 8: Hardware implementation of undergrounddrainage and manhole monitoring system

VI CONCLUSION

By using the proposed system, monitoring of the sensors can be done using Blynk app, manhole cover can automatically open and close using RFID card. If any problem is detected at particular manhole, location of the manhole will send to the officials. Hence, the proposed system can be used to reduce the above problems.

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