Drainage Monitoring System Using Arduino

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Abstract:

***The* future goal for a smart city is to have a cleaner society. One of the crucial factor to be considered while implementing a smart city is excellent underground drainage system management. Drainage system monitoring plays a significant role in keeping the city clean . In fact, most of the rural areas does not even have drainage monitoring team Manual monitoring is not the most effective way for drainage management. Manual monitoring also takes more time to solve drainage problems due to slow handling of these drainage problems. So to tone down all these issues, the system using arduino consisting sensor nodes is implemented. This paper represents the application and implementation of a smart and real-time Drainage Monitoring System . The manholes present inside the drainage will have a module which has a arduino interfaced with gas sensor, flow sensor, NRF. The system will monitor if the blockage is occurred in the drainage or rise in the toxic gases. The proposed system is low cost, low maintenance, it works in real time and alerts the managing station through a message when any of the manhole exceeds itsthreshold values. This system will reduce this risk and will also benefit for public health and safety.**

Keywords: Arduino uno, GSM module,Gas sensor, NRF, RTC, Water flow sensor.

I. INTRODUCTION

A paper that discusses the possible system with real time constraints, which has been designed to prevent the people especially who clean the channels or drain from the infectious diseases, harmful air and especially for avoiding accidents while cleaning the drainage. The drainage channels built to control the surface water due to rain, waste water. Drainage has an important role in the prevention of flood danger. So, this system gives accurate information every time about drainage channels to being alert before the flood danger and blockage, which create overflow of water. Drainage condition should be monitored in order to maintain its proper function. During dry weather, the sewage is adequately transported to the treatment plant. However, during rainy weather, much of the sewage overflows into our channels before it reaches the treatment plant. This overflow contaminates our local waterways. This overflow not only violates the federal Clean Water Act, but they cause a host of other problems for communities and the region as a whole. Children can get exposed to raw sewage from overflowing manholes/drainage in the street . In an effort to reduce these issues Real Time Control assumes continuous monitoring and controlling of the flow process. In principle, the control of a process can be schematized to a simple control loop. This control loop requires sensors to measure the process, like water level, gases (carbon monoxide (CO), sulphur dioxide (SO2), methane (CH4)). These sensors transmitted the data to GSM module at receiver station. As there are many blocked and unclean open drains in the country which causes unhygienic situations which lead to various health problems in humans. Due to waterlogged streets there are many road accidents which lead to harm.This causes blockage in drainage and unhygienic drains which cause bad health.

2. PROPOSED SYSTEM

In this drainage monitoring system, we have sensors that will detect blockage, flow and toxic gases in the drainage. The data will collectively be sent by the gateway node and we can easily monitor and rectify the drainage problems in real time. The proposed system consist of sensor nodes and a gateway node for receiving the signal from sensor node and sending the alert message to managing station. Components used for both sensor and gateway nodeare:

1) Arduino-ATMEGA328P: Arduino is as a microcontroller.It consist of analog pins, digital pins, transmitter and receiver pins and etc.

2) RTC-DS1307 real-time clock IC: This battery powered clock allows you to keep reasonably accurate time even when the Arduino is powered off. It is very useful in data logging and other time sensitive applications. The device uses I2C to communicate with the Arduino.

3) NRF-24L01: The nRF24L01 is a wireless transceiver module, meaning each module can both send as well as receive data. In sensor node it will be used as transmitter.

A] Sensor Node: Sensor node has two sensors connected to arduino.

i. Flow Sensor- YF-S201: To measure the quantity or the rate of flow of liquids or gases flow sensor is used. We are using water flow sensor to detect overflow.

ii. Gas Sensor-MQ2: MQ2 Gas sensor detects combustible gasses and smoke.

B] Gateway Node: Gateway node has a GSM module. GSM (Global system for mobile communication) is a mobile communication modem . A GSM uses time division multiple access (TDMA) technique to digitize and reduce the data, which is then send down through a channel with two different streams of client data, each one in its own time slot.

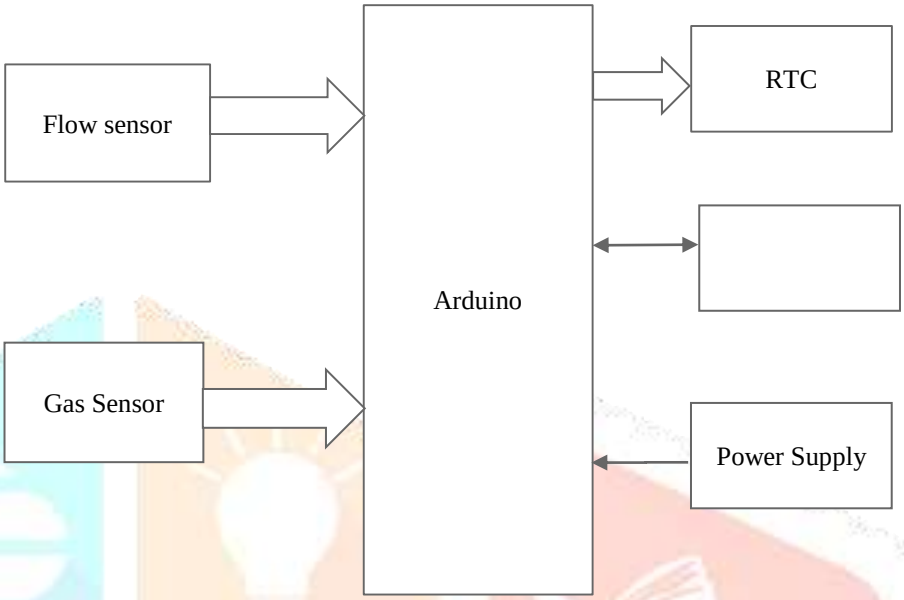


Fig. Block diagram of sensor node

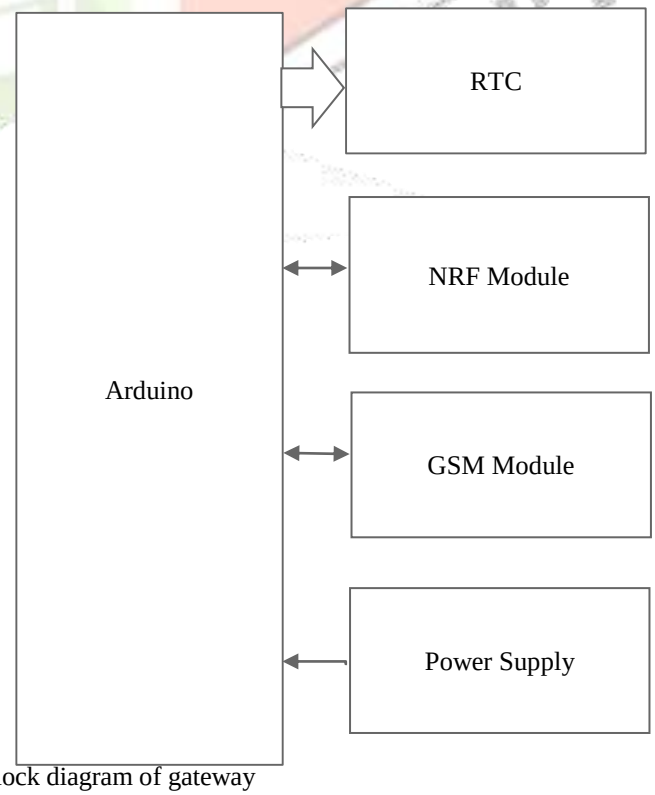
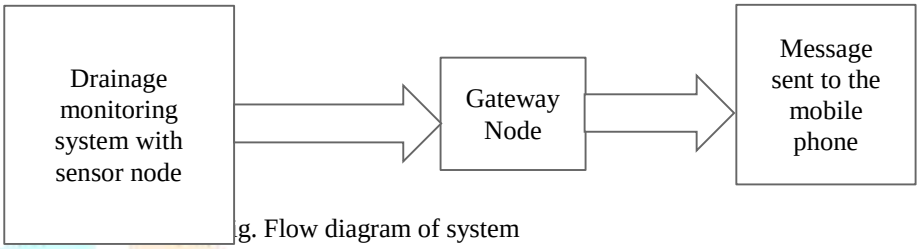


Fig. Block diagram of gateway

3. WORKING

When water flows through the rotor of flow sensor, rotor rolls. Its speed changes with a different flow rate. The hall-effect sensor outputs the corresponding pulse signal. This one is suitable to detect flow of water in the drainage. In the gas sensor when a gas interacts with the sensor, it is first ionized into its constituents and then it is adsorbed by the sensing element present in the sensor. This adsorption creates a potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage . This signal is then conveyed to the processor unit through output pins in form of current.. A specific value is fixed as a threshold value.The threshold value is determined according to the sensor behaviour. The value sensed by the sensors is checked against the threshold value. The readings from the sensor are collected and sent to the gateway node. If readings of any sensor exceeds the given threshold value the alert message will be sent to the concerned authorities through GSM which is present in the gateway node.



g. Flow diagram of system

4. RESULT

The sensor device detects all physical parameters such as gas pressure, water level, blockage, smoke due to the release of chemicals and gasses inside the manhole and translates these inputs into electrical output, receives this electrical output as an input to arduino and is programmed in such a way that all the information is transmitted to the server in specific time intervals. and The text sms of the offline warning will be sent to the predefined mobile number.To make the system effective, the readings of the data are taken in real time, which means the readings are obtained for every second. It will measure water flow in milliliter per second. So if the blockage happens between the manholes, the water block inside the drainage is very easy to clear. This allows the controlling station to know the water level status.

5. CONCLUSION

Underground observance is nowadays very difficult. This project includes completely different ways to track and control surface drainage systems. This illuminates various applications such as real-time underground maintenance and tracking. It will also reduce the risks, and prevent them. Arduino, Water flow sensor and Global System for Mobile -GSM are also being monitored and updated in real time . It has implemented and tested the low price, low maintenance, more reliable, time cycle water quality metering program. Through this process, the officers will monitor the levels of pollution that occur within the drainage and will send a message to the officers. This can help prevent illnesses caused by contaminated water. Fast action may be taken to restrain severe pollution levels. In the parallel way, data processing can be achieved by detecting the Water flow sensor, Gas sensor and Global System for Mobile. By doing so it reduces water and disease wastage.

6. FUTURE SCOPE

This paper focuses on all requirements for metropolitan cities about smart real-time drainage monitoring system. In future, the systems of Smart Cities could be changed to intelligently interact and control the drainage manholes. By using different sensors such as a gas sensor, we can track the real-time drainage system scenario. By doing so, we will take specific action on the issues because we receive early blockage warnings as well as rise in gas levels. This paper can be used to design the intelligent real-time drainage system for monitoring and troubleshooting purposes. Further PLC controllers and SCADA systems can also be used as a drainage water treatment system, drains can be monitored, examined and this water can also be used for irrigation purposes, toilet cleaning, etc. PLC controls the sewage treatment plant process mainly and SCADA is a remote terminal unit which monitors and controls the whole region.

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