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Problem of Sewage Blockage

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ABSTRACT

Monitoring of sewage system is important to keep the city clean. The uneven monitoring of sewage system leads to blockage of the drainage. Blockages in sewers are major causes of both sewer flooding and pollution. In order to manage sewer blockage proactively sewer managers need to be able to identify the location of blockages promptly. The main aim of this study is to make comparative analysis on sewage maintenance system done by various researchers in the past.

Keywords: IOT, sewage Monitoring, Arduino.

[1] INTRODUCTION

Overflow of sewage is the most common problem across the country. Many cities are on the list to become smart cities but sewage maintenance is still a problem to be solved. Overflow affects most peoples and their daily routine. The current sewage maintenance system is not fully capable of controlling the flooding. A system is developed by which sewage flood can be diminished by sensing of increased sewage level. The system contains sensors to sense level, micro controller for further command and a network to register problem. A base station has to be established to record data. The system monitors the sewage level and when there is a situation of over flow it alarms a signal and sends message to concerning departments. If drainage system gets blocked and water overflows it can be identified by the sensor system. And that sensor sends information via the transmitter which is located in that area to the corresponding managing station.

[2] RELATED WORK

A system of sewer pipes collectively called sewers, collects the sewage and takes it for further treatment or disposal. Properly functioning septic tanks require emptying every 2–5 years depending on the load of the system. An underground sewage system was designed where all the waste from the home and industrial waste water are collected together and driven together.[2] Sewage overflow on roads is a major problem in cities, where large numbers of complaints are launched and no actions are being taken.

A sewage level monitoring system was developed where paper discuss about the design of drainage systems intended to monitor conditions at several points in drainage system using wireless sensor networks. Some sensor nodes are deployed at several determined points to be connected with each other. The recorded data will be stored into a database that is visualized by Geographical Information System (GIS) [2]. The monitoring parameters are water levels in drainage, water discharge and rainfall conditions around the drainage area.

This ideology is expected to monitor the drainage conditions real time continuously, and to store the data properly. The presenting data through GIS is expected to be a reference for determining drainage master plan in an area.

Recent studies proved that storm water coagulate into sewer system and causes sewer overflow problems, for which Storm Water Management Model (SWMM) [2] is used in a study for simulating rainfall driven flow in a sewer system that could cause overflow in sewer networks. The simulation is carried out in a residential area where storm water network is not fully developed. The report says that severe rainfall causes sewer overflow and surface inundation in the area. A number of actions have been proposed which includes capacity upgrading of sewer system, decline of discharge peak and reduction of ex filtration as a counter measure to solve this problem. In many places sewer level detection is being carried to detect the level of the fluid in advance to overflow problems. In recent years Japan has often experienced unexpected intense rain due to the development of cumulonimbus clouds; these are frequently occurring downpours[1]. Due to relentless downpours, sewer systems have overflowed and numerous instances of flood damage have been experienced mainly in cities. Equipping manholes in sewer line infrastructures with sensors can measure water levels and accurately detect early signs of overflow. However, the operating cost for each sensor is expensive, making it difficult to install sensors across a wide area. For this reason, the number of sensors installed needs to be minimized. However, the effective installation of sensors was largely dependent on intuition and experience of the workers[1].

There are various news articles related to SSOs(Sanitary sewer overflow) and deaths occurring due to poor maintenance first constructed before the sewers are set. The manhole can have multiple incoming and outgoing pipe connections, through which the wastewater flows. By design the pipelines have a gentle slope which facilitates easy flow of liquid waste. The various parameters that the paper proposes to study are: width and depth of the manhole, incoming and outgoing pipe connections with dimensions, benching on each side and the manhole base slab. To maintain downstream flow unanimously pumping stations are built in low lying areas

This architecture expands across cities and forms the entire network of sewage. Many approaches have been suggested for the management and control of the sewage system, including the use of cameras and the installation of sensors in the manholes. The literature offers a summary of a system that tracks the blockages occurring between two manholes additionally sensing a rise in water levels and varied gases, potentially harmful to humans.

The system then triggers alarms, providing Health Departments with critical data. Another low-cost, and low- maintenance solution is to provides IoT based real-time notifications to management stations via email when any manhole exceeds its threshold values. It is found that within a specified geographical area the use of LoRaWAN[8] protocol can achieve maximum transmission distances of 20 km and up to 35 km of visibility in an urban environment.

This paper addresses many important challenges regarding existing drainage systems, including negligence of manhole maintenance, lack of real-time maps of sewage networks, delayed actions in the event of serious damage, with minimal presence of IT solutions in this domain.

Many municipal corporations have area wise Nala Basin maps for Sewage lines only. But since these are static maps, withno regular updates to the database they are not useful for critical decision making. Further, less emphasis has been given on manhole specific maps.

Smart Real Time Drainage Monitoring System Using Internet ofThings:

A smart real time drainage monitoring system using various sensors is designed. The water level will determine the extent offlood as low, medium or high[1].

IoT based Sewage Monitoring System:

The sewage inspection framework forms were used to save workers lives in unsafe conditions. It sends a remainder to the offices that employ these workers when the ppm levels of specific gases go beyond the prescribed levels. Arduino is used in the survey but Arduino cannot handle so many sensors at a time so it would not be an effective approach[7].

[3] COMPARATIVE ANALYSIS

The table indicates the comparative analysis of various researchers done on sewage management; it assembles a brief description of different ideas that has been put forward by them in order to achievea well-organized system for future.

Table 1: Comparatative analysis

RESEARCH PAPERS	AUTHOR/YEAR	METHODS	RESULTS

IOT based sewage blockage system	Dr. Manikandan RPS, December2022.	Use of ARM7 to sense the water level in sewage. Use of GSM in sensors to send automatic alerts.	The data from the sensor is sent to the microcontrolle r. An alert message is also sent to the mobile number of theresident.
Detection of sewage blockage	Rucha Patel, Asim Bhalerao, October2022.	Formation ofstar network. Implementati on of LORA technology.	High manual interventions which can beeliminated byhaving Smart solutions for sewage systems will be more beneficial in terms of more effective anddata driven decision making.
Performanc e analysis ofsewer network	Ahmad Alshami, Moustafa Alsayed,October2021.	Use of Data analysis algorithms to maintain record of dataof ultrasonic sensors	Performance of the sewers were acknowledged .
Undergroun d drainage monitoring system	Booma Devi C, LakshanaaD, March2021.	Fiber Bragg Grating (FBG) based monitoring system for continuous humidity and temperature measurement has beendesigned.	Toxic gases, flow and level of water are being monitored and updated on theinternet.
IOT based sewage clearance system	Dharini S.G, Kaviya,june2020.	Use of Arduino, gas sensor and level sensor.	Block is cleared by high concentrated solution.

Table1 shows a brief description about various ideologies by researches for the sewage management. It compared the performance of the sewage network before and after the occurrence of the blockage.

Defined below are some of the tools or sensors that were developed in past:

ARM7 is a processor that is programmed to sense water level in sewage and blockage. A gas sensor is attached that gives an alert of any leakage via message and sound buzzers.

A level sensor is used to detect the level of water in the drainage and display it on a screen. Sensor is used in detecting a clog and rate of flow. The WEMOS D1 is used to check specific conditions and it can send automatic alerts via GSM and can update it in real time [5].

Researcher tried to use a variety of sensors such as temperature sensor, water level sensor and gas sensor which are interfaced with a PIC Microcontroller. System monitors the level of water and toxic gases.

A smart drainage monitoring system using a variety of sensors is designed[1]. The level of water will determine this.In the study ,a system is being installed which includes a device which will be installed inside a manhole chamber on the side/vertical wall. The device inside a manhole will consist of a microprocessor, a level sensor, a gas sensor array and an IMU. The ultrasonic sensor will record continuous measurements of wastewater levels . Drastic changes in levels will be one of the parameters that will help trigger a red flag. The IMU shall monitor the device health. The threshold values for sensed parameters will be configured. If the thresholds are crossed, alerts will be triggered based on the severity. Installation of several such smart wireless devices in manholes of a particular area connected to a centralized gateway will lead to the formation of a star network. A centralized monitoring system will be developed for keeping track of the entire network. The data from all the edge devices will be directed towards a central gateway, which will further send it to a centralized monitoring system. The user can view the alerts sent from the devices through web application dashboard.

4. WORKING OF DRAINAGE SYSTEM

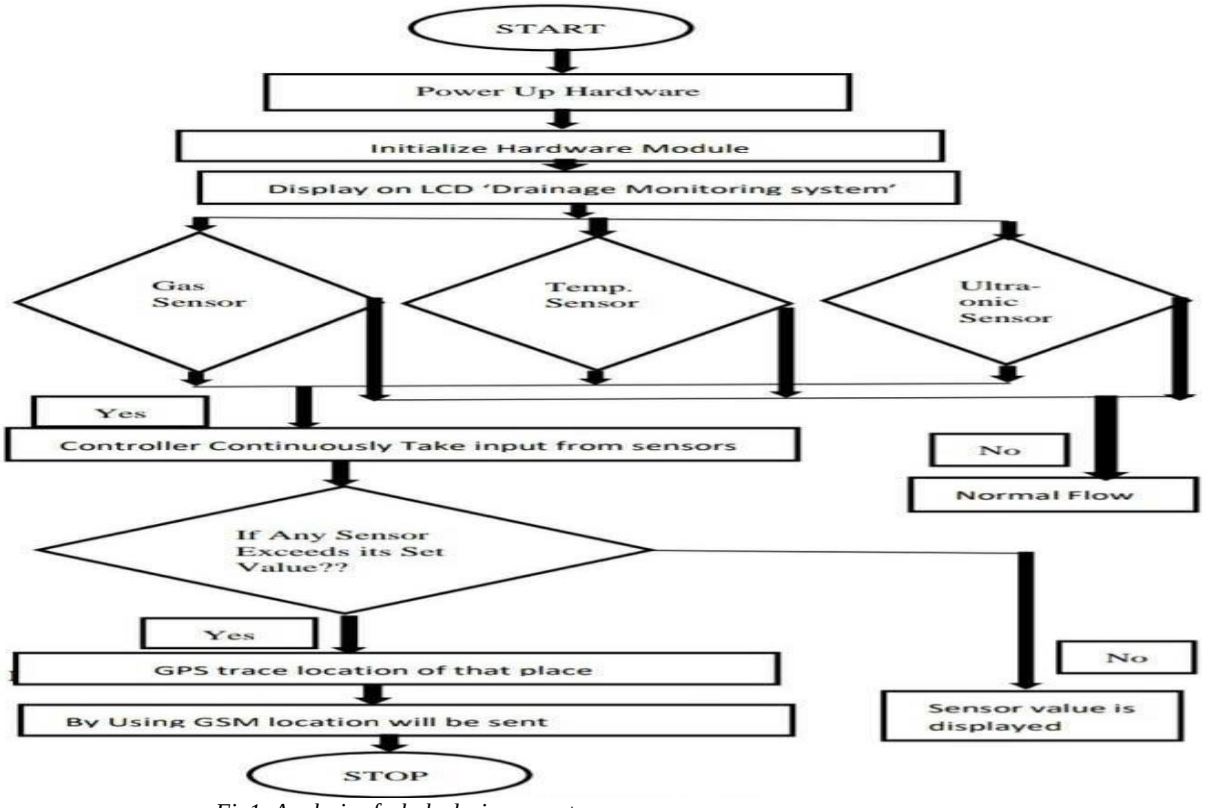

Fig1: Analysis of whole drainage system

As Shown in Fig.1 Link the device (Hardware) to the power supply. Initially, the LCD shows the flow rate and the system's environmental state, with or without dangerous gases. If the ultrasonic sensor is triggered, the buzzer will be activated and the sound and GPS position and the notification will be transmitted to the registry phone. If there is a wave, the wave sensor is sensed and the flow rate is reflected on the LCD.

This explains different methods for monitoring and managing underground drainage system. It explains various applications like underground drainage and manhole identification in real time. Various parameters like temperature, toxic gases, and level of water are being monitored and updated on the internet using the Internet of Things.

This enables the person in-charge to take the necessary actions regarding the same. In this way the unnecessary trips on the manholes are saved and can only be conducted as and when required. Also, real time update on the internet helps in maintaining the regularity in drainage check thus avoid the hazards**.**

It helps to reduce the problems of drainage system with the help of

sensors like ultrasonic, gas and Temperature sensors. Treatment mechanism helps to notify the registered number, when the harmful gases are detected to gas sensor and level is detected by ultrasonic sensor, with help Wi-Fi module like Arduino which is connected with the blink server. By this flow of steps the underground drainage system can be easily organized.

5. Conclusion

Many sensors were installed and various technology were used in order to maintain a proper sewage system as mentioned in table1. It was hard to work on any one of it because of economical or geographical reasons such as some very costly whereas some sensors tended to work in a particular weather or a region. Hence, it was hard to select one for the proper balance of the sensor-based sewage management. At present times underground observance is difficult. The study done in the past in favor of treatment methods proposes a totally different way for managing the underground system. It provides an efficient way in detecting a clog. This can be implemented in remote residential areas and can be operated.

Although IoT has many benefits and potentials, lots of difficulties still hinder its advances andchallenge its market such as power and security issues and public awareness. Thus, it is a very hot area of research.

Nevertheless, IoT is expected to give much more prosperity in the very near future. Sewage is a big issue which has to be dealt with for a permanent solution. IoT has lots of potentials and opportunities in the near future. Many devices all around the world areexpected to very soon join the huge network of things and devices.

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6. Future Scope

The finding of the impact of blockages on the sewer overflow occurrence was an identical point for the research, it emphasizes the need to build a monitor system connected between the pipelines blockage situations and sewer overflow occurrence for our future work. Such a developed system should predict blockage occurrence by real-time analysis of streamed data provided by the sensor so that sewer overflow would be predicted and proactive decisions could be made.

While the sensors provide the decision-makers with raw data that can give an initial indication of the situation ofthe drainage network, the lack of connection between the sensors and an effective system depends on IoT and AItechniques to ensure accurate, smooth, and fast streamingof the network make the process less advanced, whichwill be the start point for our next system we intend tobuild. Hence, finding a stable and strong technic connection between the system and the sensors through clouding would be a foundation that needs to be worked on in near future.

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