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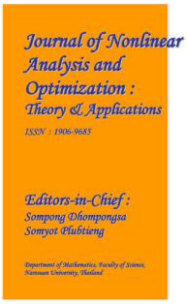

IOT BASED MANHOLE MONITORING SYSTEM

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Abstract
A smart city is the future goal of clean and better public services. Underground infrastructure is an important factor to consider when launching a smart city. The monitoring of the water supply system is critical to maintaining the city clean and hygienic. Due to the ineffectiveness of physical manipulation this results as un-dealing with issues that slow down water and require longer to fix. To address all these issues a system based on a wireless sensor network comprised of built-in sensor nodes has been developed. When the water flow level is lowered the suggested system sends low-cost, low-maintenance IoT-based real-time notifications over the management channel. This approach lowers the danger of mortality for fishermen who clean subterranean canals while also benefiting the community. Manholes are not effectively checked in developing countries. These unsecured manholes can endanger lives in a number of ways. The article describes an intelligent automatic manhole monitoring system that detects dangerous gases and temperatures within the manhole, as well as the lack of a hole cover, and emits an alarm to passers-by alerting authorities to the system's status. The system has the potential to enhance overall environmental quality. The technique was used to perform automatic manhole monitoring in order to assess suggested enhancements.
Keywords: Drainage Level; Smart City; Water flow level;Manhole Monitoring;

1. INTRODUCTION

Clean and improved public services are the future goals of a smart city. When establishing a smart city, intelligent
subsurface infrastructure is needed.

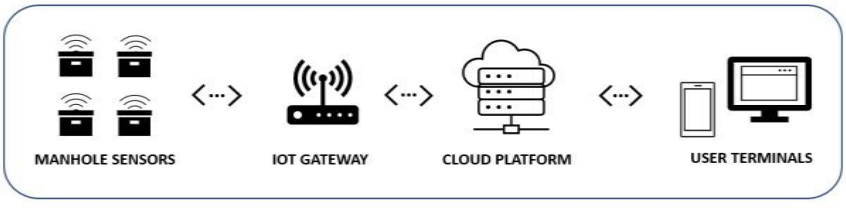

Fig. 1.REQUIREMENTS FOR MANHOLE MONITERING SYSTEMS

The huge majority of urban communities have adopted the subterranean trash framework and it is the responsibility of the monitoring station to maintain the tidiness of the urban communities. If the seepage support is not authentic, the clean water becomes contaminated with waste water and infectious diseases may develop. In the event that waste gets obstructed and water floods, sewer vent cover gets opened which prompts difficult issues like fall of vehicles/walkers into the sewer vent. Groundwater deliberation plan and the city civil association should keep up with its tidiness. It

essentially recognizes in the field of caution individuals about gas blasts, rising water levels and temperatures. It utilizes the IoT to make the water stream checking framework a high velocity vehicle utilizing a sensor to get and send GSM cautions and GPS modules to specialists. This undertaking conquers the burdens by recognizing water spills by embedding water stream sensors at the hub crossing points. Assuming there is a blockage in a specific region, there is a variety of the water stream that in the event that it falls over the set worth demonstrates an admonition to the administration station [1]. The term "automated internet of things for underground drainage and manhole monitoring system for metropolitan cities" refers to a system for monitoring manholes that transmits and receives manhole information via collecting terminals and collects the information sensed by sensors, a server, and a relay terminal. Flow rate sensors are also utilised to detect excessive water flow and alert the control station with an automated message. Due to the harsh atmosphere within, manual manhole storage it is time-consuming and risky. Therefore, the primary goal of this project is to develop a system that analyses water quality, air temperature, water flow, and harmful substances. When the drainage pipe is blocked and the water in the field overflows, nerves detect it and send a message to the municipality [2].

The sewer vent, which is supposed to inspect, clean and remove obstructions in the sewage line is also becoming the cause of disasters, claiming lives and impacting them. The majority of the frameworks in the are not computerised. The majority of urban communities are now utilising an unpleasant underground seepage framework and it is the responsibility of the supervising station to keep up the cleanliness of the urban communities. If waste administration is not attentive, clean water can get contaminated with seepage water and infectious diseases can proliferate. During the rainy season garbage is hampered, it may flood and disrupt daily life. For example, transportation may get clogged the climate becomes polluted and open spaces may be disrupted. Analyses the innovation process and current condition of the home pipeline checking framework; it will most likely fight the burglary of the primary opening to complete network surveillance; and its transmission approaches are advancing from one remote to another as reported in [3,4].

Sewage intended for inspection, cleaning and removal of sewage from sewage also becomes a source of accidents, life-threatening and contaminated. Many developing-country facilities are not automated. Often these cities today have an insufficient drainage system and it is the station management's obligation to maintain the streets clean. Clean water becomes polluted with flowing water if the flow of water is not correctly controlled then infectious illnesses can spread. During the rainy season, the drainage pipe becomes clogged, causing overflow and causing general living difficulties such as traffic congestion, the environment is contaminated, and the public is angered. To address the issue, we must use sophisticated automatic pothole monitoring, which detects dangerous chemicals and poisonous gases within manholes, as well as the lack of a hole cover, and generates an alarm that alerts passers-by and alerts authorities about the status of the system. The system has the potential to improve the overall quality of the environment. As a result, the responsible authorities may take necessary measures to keep the hole open. The technology is intended for use in educational settings to remove automated monitoring of suggested test hole features [5].

K. T. Wegedie [6] is aiming for a versatile IoT system that enables for solar energy harvesting, long-distance data transfer, trash bin geo location, easy measurement, lower costs, and offers reliable real-time information to a municipality or waste management firm. As a result, in order to suit the demands of a municipality or waste management firm, an IoT system is designed. Hoornweg D [7] and his team discovered network requirements and knowledge of groundwater source resource management, minimizing ground cable maintenance burden and ensuring ground cable safety, home pipe monitoring environment system. Its goal is to fight cover theft of cover to complete network surveillance and its transmission systems are improving from wireless to wireless. According to M.S. Islam and his team's analysis [8], monitoring centre software is separated into four categories based on its work and independence: website, SMS module, voice processing module, and administration software. Voice

processing module and SMS transceiver module are both Windows apps, whereas management software is an NB-IoT application. There is no contact between modules, and all data transfers take place through a database. This structure successfully prevents cross-system interactions, and each module can be built and tested individually, reducing development complexity and increasing development efficiency. The problem of covers of stolen and mismanaged urban gas resources is already severe [9-11], and the current system of monitoring urban pit covers has single monitoring limitations, immature technology, and insufficient comprehensive analytical capabilities. The paper proposes a smart hole cover monitoring system based on small Internet of Things (NB-IoT) technology to address these issues. A vision layer, a network layer, and an application layer make up the software.

The article outlines the development of the manhole pipeline monitoring system as well as its present state. The main goal is to monitor the overall drainage system from certain authority to solve the issue, if any manhole gets blocked. In existing methods, they analysed manhole cover open close detection and using the sensors to know the corresponding values of water flow, water level, gases and temperature. In proposed system we are implementing automatic control of solenoid value to change the water flow direction, when the flow is reached to certain threshold value. This automatic system will help to outcome from the blockages.

PROPOSED METHOD

The majority of cities now have an inadequate subterranean drainage system, and it is the responsibility of the management station to keep the city clean. If drainage is not properly maintained, clean water might get polluted with drainage water, resulting in the spread of infectious illnesses. During the rainy season, the drainage system becomes clogged, and it may overflow causing traffic congestion, pollution and public dissatisfaction. It is proposed to build a low cost, low maintenance, reliable and quickly deployable system for quality improvement in order to overcome the obstacles of previously examined data. It is also required to notify the appropriate authorities if the manhole becomes clogged. To keep an eye on the water level in manholes, sensors will be installed that will detect and communicate the information needed to remove the clogs before they overflow.

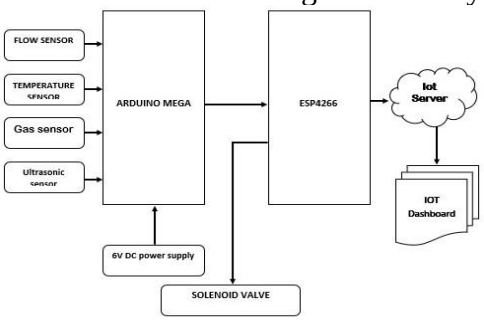

Fig. 2. PROPOSED METHOD

In this proposed method, Arduino MEGA microcontroller is used to interface with the sensors and to the communication devices. The MQ5 Gas Sensor module is used to detect the gas leakage. The liquid temperature sensor sensing temperature of drainage water. The ultrasonic sensor detects the water level of tank. Flow sensors are primarily used to determine the volume or rate of flow of liquids or gases. The solenoid valve used for open or close the drainage water in emergency situation. Here automatic control solenoid value will help to outcome from the blockages.

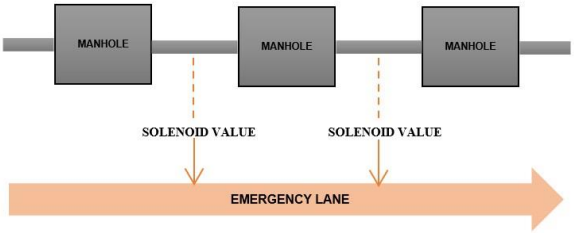

Fig. 3. AUTOMATIC CONTROL SOLENOID VALUE SYSTEM

If the particular area or region the flow water is getting low to its threshold value then automatically solenoid value gets opened and changes the flow direction into emergency lane after cleared out it will get closed, which is interconnected to manholes to overcome the blockage. The ultrasonic sensor delivers the water levels of the manhole tank, which we use to detect overflow. The LCD is used to display the updated value from the sensors. These sensors observed the manhole and send information to the base station. Therefore, it is useful to enter manhole with present state information to rectify any problem.

Fig. 4. HARDWARE PROTOTYPE DESIGN

The ESP8266 is a WIFI module is utilized to send information from the control unit to the base unit, Wi-Fi transceiver operating in frequency range of 2400 – 2484 MHz It is common with Arduino and microcontrollers in most embedded applications. The module offers internet technology for communication with the use of a mobile hotspot. In our system, the module is used to transmit the data to IoT web server.

RESULT AND DISCUSSION

The prototype of the manhole's monitoring system is developed and tested. The technology is designed to provide notifications to concerned authorities regarding the state of manholes, allowing them to take appropriate action to resolve the issue. The technology is meant to continually monitor manholes and deliver real-time data on their state. Interfacing the Arduino with IoT with help of NodeMCU to update the real-time status and alerts to concerned authorities. Here dashboard consists of water level, gas value, flow rate and temperature in web server to monitor real-time data.

Fig. 5. RESULTS

In this server layout indicates the drainage level, flow sensor, gas(methane) and temperature to monitor from base station. Gas sensor and temperature sensor will update the status of current condition. If methane is detected, it will show in status '0' otherwise '1'. Here drainage level is nothing but water

level in sewage manhole, Flow sensors is to detect the water flow in every manhole. When the flow reaches its threshold value in any particular area then solenoid value will open automatically and change the flow to emergency lane to reduce the water clogs.

CONCLUSION

With the help of sensory aids such as water level sensors, gas sensors, temperature sensors and flow sensors, our project aids in the alleviation of drainage system problems. The method helps to notify the connected network. When the dangerous gases are detected and water flow rate is getting low it will automatically update in web server. For this project groundwater the system can be easily configured.

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