Smart Drain Monitoring System with Alert Messages

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Abstract - The poor drainage system is unhygienic and alarming for our environment. It carries a vast number of harmful gases like CO2, CO, CH4, NH3, etc. We have designed the device to control the overflow of drain water. In an overpopulated country like Bangladesh, it is a common scenario where drains are filled and blocked with plastics. As a result, the vast amount sewage and harmful gas is increasing day by day. But authority does not get any alert about the blockage. Sometimes the dirty water comes out from the drain and blocks the entire road with this drain water. People face hustle to walk or move for these situations. That is why we have designed this device to relieve human suffering. We use gps to get the actual location of the drain. Moreover, we usedhere GSM so that the nearest authority can get the daily update of the water level, sewage gas, and sewage distance of the drain. Before the overflow of the drain water, the authority can take action to clean the drain. The local people also have read-only access to the website which increases credibility and answerability and thus it can be path to solve composition problem a swell. We have implemented this system so that only the authority can get control of the system. Because of security purposes, we are not giving full control access to the local people. The local people can only have read access to the website according to our plan.

Index Terms – Drain monitoring, GPS, NodeMCU, Alert messages, Blynk app.

I. INTRODUCTION

Everyone has the right to live in a healthy environment. Flooding due to obstructed drain is a very common phenomenon in many developing countries that leads to unhygienic surroundings. Because of this, many health issues appear when the air gets poisoned due to sewage gas. One of the key causes of increasingly growing Aedes mosquitoes is the stagnant water on the road for to long. It is difficult to track manually, and the issues become apparent only when they are already clogged and the whole region is filled with water. A poor drainage system can lead to many diseases like campylobacteriosis, typhoid, hepatitis A, gastroenteritis. Diseases like these can spread through direct touch or even through indirect contact. It can also spread if people step on the dirty sewage or drain water as they can carry the germs fromone area to another. Insects, dogs, mice, cockroaches, and other living organisms also participatein spreading. Solid waste and water staying in a place for too long are one the factors for alarming rise of dengue.

If drainage water is not cleaned for too long, it can harm the environment and make the area smelly and hard to live in. Due to clogged drain, even after slight rainfall, the streets get filled with water. The drain gets clogged because some people are throwing plastic bags, plastic bottles, etc. in drains. So, it has become a necessity to have a way to monitor if the drain is clogged and has made the whole area filled with dirty water and if the area is filled with harmful sewage gas that can cause asthma.

II. LITERATURE SURVEY

[1] **Drainage and storm water management strategies for low-income communities by Jonathan Parkinson.**

Based upon a review of the literature, this paper focuses on the provision of drainage systems and stormwater management strategies in low-income urban settlements. Although engineered infrastructure is a necessary component for drainage of urban runoff, non-structural approaches are important complementary measures, focusing on actions to prevent and mitigate problems related to flooding, as well as those related to pollution and deterioration in environmental health conditions. As these rely predominantly on behavioral changes to be effective, a participatory approach is recommended within a strategic framework of urban stormwater planning.

[2] **Intelligent human free sewage alerting and monitoring system**:

The proposed method aims at the development of an inexpensive autonomous drainage system using Internet of Things (IoT) and without human intervention. For efficient operation of sewage system real time data, determination of the level of silt and water is very essential. More the runoff volume, with high impenetrable ground, the aggressive growth of population with enormous monsoon has over affected the sewerage system causing overflow and clogging, these all obstacles can be eliminated if an intelligent system which identifies both the level of water and correspondingly redirect the water with the help of sensor-controlled gates is installed. Using the present Artificial Intelligence(AI), IOT principles along with suitable survey of the sensor information, a smart system can be implemented which provides a real time detailed observation and informing the data to Municipality Organization of the concerning authority. This process will avoid physical drain examination and allows the instant reaction in the absence of human involvement or delay.

[3] **Web-based Realtime underground drainage or sewage monitoring system using Wireless Sensor Networks**:

Drainage is the system or process by which water, sewage or other liquids are drained from a place and to maintain the proper function of drainage, its condition should be monitored regularly. But manually it is very difficult to monitor all area where a human cannot reach. This influences the blockage of underground pipes and overflows of water cause the health problem. To mitigate all these issues here we are developed and implemented the system using wireless sensor network. It is consisting of small devices used to collect data. These sensing devices are called node. The proposed system is low cost, less maintenance, long life, and web-based real time system, which update the municipal officer by text message when any manhole crosses the threshold value. This system directly impacts on the health issues of citizens and worker who cleans the underground drainage. It also avoids spreading of infection due to mosquitoes and gives clean and healthy environment as well as controls the diseases such as malaria, dengue, diarrhea, etc. The system reduces the accident caused by an exposed manhole.

[4] **Smart manhole system:**

Communication through web is turning out to be a smart city is that the long-term goal to possess cleaner and better amenities for the society. Smart underground infrastructure is additionally an infinite feature to be considered while implementing a wise city. system monitoring plays an unlimited role to remain town clean and healthy. Since manual monitoring is incompetent, this finally winds up in slow handling of problems in drainage and consumes longer to resolve. To mitigate of these issues, the system employing a wireless sensor network, consisting of sensor nodes is meant. The proposed system is low cost, low maintenance, IOT based real time which alerts the managing station through message when any manhole crosses its threshold values. this method reduces the death risk of manual scavengers who clean the underground drainage and benefits the final public.

III. OUTCOME OF LITERATURE SURVEY

From the thorough analysis of the literature survey papers we could understand the operations of different types of drain monitoring systems. Some of the surveys have dealt with an IoT mode and the methods to store the information and access it. Some methods are based on web technologies. A few literature surveys that included the methods to develop the monitoring system and the parameters to be considered for the design of the model. From the Intelligent human free sewage alerting system proposed by Keerthi kumar M, we could understand the methods of implementation using IoT and without human intervention. A journal published by Jonathan Parkinson on drain water and storm management we could understand the provisions of drain management in the low-income urban settlements. We could enhance our intellectual thinking and knowledge on the different ways in which we can implement and improvise our project for the betterment of the society. We could analyze the drawbacks in the existing systems and could figure out ways of overcoming them.

IV. PROBLEM STATEMENT

Due to improper sewage management and clogging of drains, flooding of manholes and drains has become a common phenomenon in both the urban and rural areas. This is a major concern as it may become the breeding place for many harmful microorganisms and mosquitoes that can lead to fatal diseases among the residents. The environment can become smelly and could become difficult to live. Diseases can spread through direct touch or any indirect contact. The main reason behind such problems is the clogging of drain due to mud and sediment accumulation as they flow along with the rainwater on streets inside the drains. The mud deposition inside can become sometimes fatal for manual scavengers who oversee cleaning it

V. OBJECTIVES

- To check the mud sedimentation level inside drains which is an innovative add-on in our project.
- To check the levels of poisonous gases emitted in the drain.
- To keep a track of the water levels inside the drains.
- To create a mechanism to alert the authorities when the water reaches a certain threshold point.

VI. METHODOLOGY

As we want real-time data for viewing the live situation of water level, sewage gas level, sewage level, we use Blynkapp for showing the real time data on the monitor. Moreover, for making more user friendly and useful for the environment and human being. NODEMCU ESP8266 used as the processing unit by connecting various sensors, live monitoring for showing the present state to ensure whether the sewage level crossed the threshold values. We use NodeMCU because we need many ports for processing and Wi-Fi connectivity.

The proposed model is as shown in the block diagram given below;

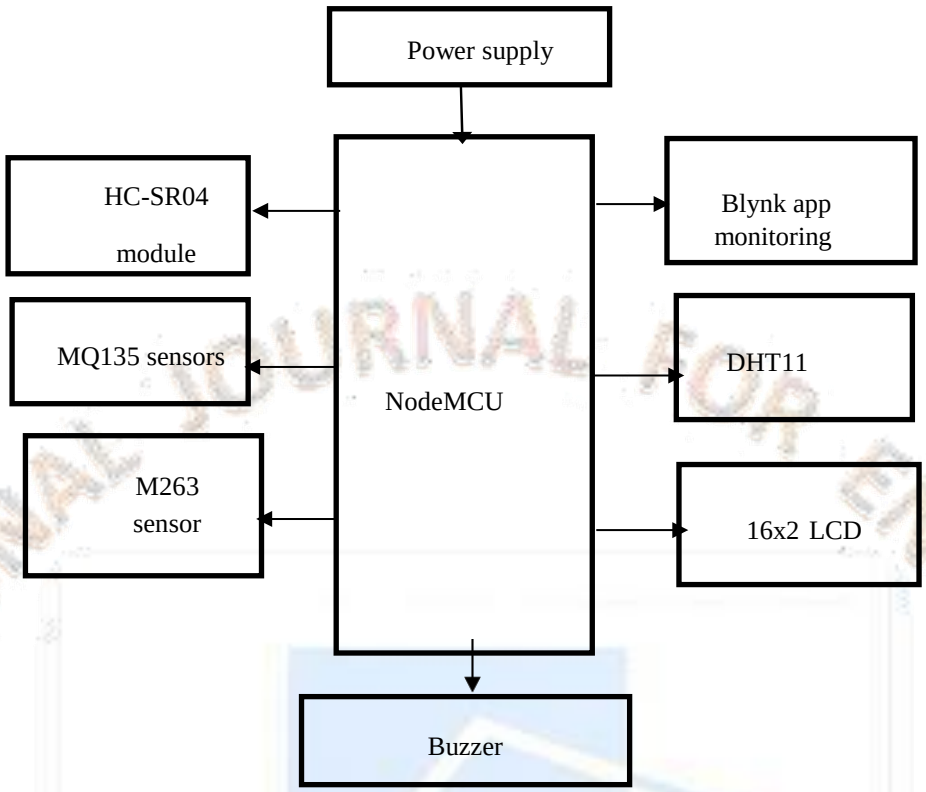

Fig 1 Proposed model

VII. COMPONENTS USED

NodeMCU

The NodeMCU (*N*ode *M*icro*C*ontroller *U*nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espresso Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

Ultrasonic sensor HC-SR04

This is the HC-SR04 ultrasonic distance sensor. This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit.

There are only four pins that you need to worry about on the HC-SR04: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground). This sensor has additional control circuitry that can prevent inconsistent "bouncy" data depending on the application.

DHT11 Temperature and humidity sensor

The DHT11 Temperature and Humidity Sensor is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and outputs a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old.

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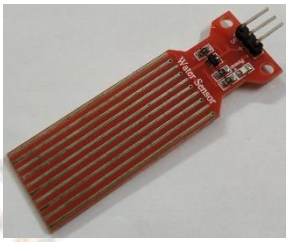
MQ135 Gas sensor

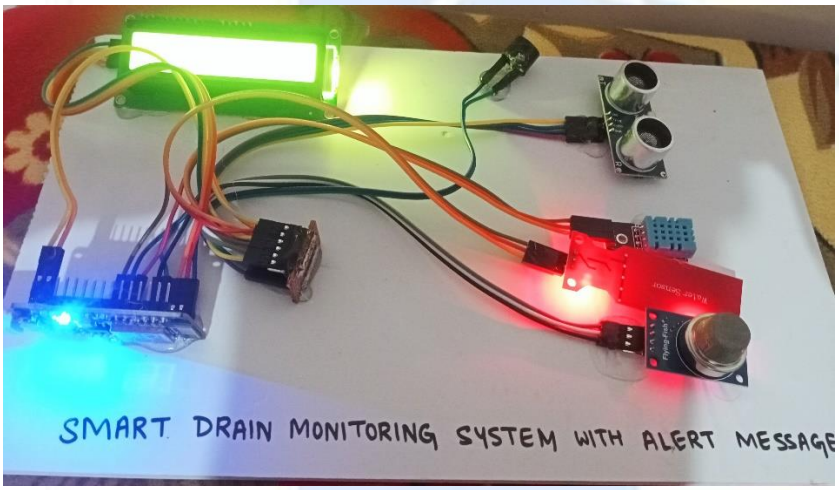
The **MQ-135 Gas sensor** can detect gases like Ammonia (NH3), sulphur (S), Benzene (C6H6), CO2, and other harmful gases and smoke. Like other MQ series gas sensor, this sensor also has a digital and analog output pin. When the level of these gases goes beyond a threshold limit in the air the digital pin goes high. This threshold value can be set by using the on-board potentiometer. The analog output pin, outputs an analog voltage which can be used to approximate the level of these gases in the atmosphere. The MQ135 air quality sensor module operates at 5V and consumes around 150mA. It requires some pre-heating before it could give accurate results.

M263 water level sensor



Water Sensor water level sensor is an easy-to-use, cost-effective high level/drop recognition sensor, which is obtained by having a series of parallel wires exposed traces measured droplets/water volume to determine the water level. Easy to complete water to analog signal conversion and output analog values can be directly read Arduino development board to achieve the level alarm effect.

VIII. DESIGN



IX. CONCLUSION

The poor drainage system is unhygienic and alarming for our environment. It carries a vast number of harmful gases like CO2, CO, CH4, NH3, etc. We have designed the device to control the overflow of drain water. In an overpopulated country like Bangladesh,it is a common scenario where drains are filled and blocked with plastics. As a result, the vast amount sewage and harmful gas is increasing day by day. But authority does not get any alert about the blockage. Sometimes the dirty water comes out from the drain and blocks the entire road with this drain water. People face hustle to walk or move for these situations. That is why we have designed this device to relieve human suffering. Moreover, we used here SMS so that the nearest authority can get the daily update of the water level, sewage gas, and sewage distance of the drain. Before the overflow of the drain water, the authority can take action to clean the drain. The local people also have read-only access to the website which increases credibility and answerability and thus it can be path to solve composition problem a swell. We have implemented this system so that only the authority can get control of the system. Because of security purposes, we are not giving full control access to the local people. The local people can only have read access to the website according to our plan.

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