International Journal of Advanced Technology in Engineering and Science
Vol. No. 10, Issue No. 05, May 2022
www.ijates.com
ijates
ISSN 2348 - 7550

Smart Drainage Monitoring and Controlling System Using IoT and Machine Learning

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Abstract

The Government of India launched Smart Cities Mission on 2015. The objective of the smart cities mission is to create world class cities as per the aspirations and needs of the citizens. TUFIDCO is the mission Directorate for implementation of smart cities mission in Tamil Nadu. It improves the quality of life, efficiency of urban operations and meets the present and future generations with respect to economic, social and environmental aspects. For making our Erode as a smart city one needs to consider many parameters such as smart water, smart electricity, smart transportation etc. There will be a required of savvy underground foundation which incorporates underground water pipelines, communication cables, gas pipelines, electric stream, etc. As most of the cities in Tamil Nadu have embraced underground seepage framework, it is exceptionally vital that this framework ought to work in a legitimate way to keep the city clean, secure and sound. In the event that they fall flat to preserve the waste framework the unadulterated water may get sullied with seepage water and can spread irresistible maladies. So diverse kind of work has been done to distinguish, keep up and oversee these underground frameworks. Too, spills and bursts are unavoidable viewpoints of water dissemination framework administration and can account for noteworthy water misfortune inside dispersion organize on the off chances that cleared out undetected for long period. This work speaks to the execution and plan capacities for checking and overseeing underground seepage framework with diverse approaches. It too give a depiction of water astute framework and location strategy to detect.

Keywords: *Alarm, Arduino, Blynk, GPS, GSM, IoT, , LCD, Node MCU Wi-Fi Module, Sensors.*

I. Introduction

The underground drainage system is an important component of urban infrastructure. It is considered to be city's lifeline. Most management on underground drainage is manual therefore it is not efficient to have clean and working underground system also in such big cities, it is difficult for the government personnel to locate the exact manhole which is facing the problem. Most of the cities adopted the underground drainage system and it is the duty of managing station (Municipal Corporation) to maintain cleanliness of the cities. If the drainage maintenance is not proper the pure water gets contaminate with drainage water and infectious diseases may get spread. The drainage gets blocked during rainy season, it will create problem for routine life such as traffic may

get jammed, the environment becomes dirty, and totally it upsets the public. Suppose if there should be a facility which would be there in Municipal Corporation (managing station) that the officials come to know immediately after blocking of drainage in which area and the exact place where it is blocked. Therefore, it is essential to develop a system whichcan handle underground 3 drainage without human intervention. Underground drainage involves sewerage system, gas pipeline network, water pipeline, and manholes.

This work describes various functions used for maintenance and monitoring of underground drainage system. It provides a system which is able to monitor the water level. 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. Today's drainage system is not high-tech. So whenever there is blockage it is difficult to figure out the exact location of the blockage. Also, early alerts of the blockage are not received. Hence detection and repairing of the blockage become time consuming. It becomes very inconvenient to handle the situation when pipes are blocked completely. Due to such failure of drainage line people face a lot of problems. Cleaner cities and intelligent management of drainage in the city. Detection of drainage water level and early stage blockages in the drainage by using Machine Learning techniques. Checking water flow rate continuously, as well as sending automatic mail, display on the monitor if the water level is outside of an expected normal range. The main objective is to obtain an effective low-cost and flexible solution for condition monitoring and infrastructure management in the city.

II. Existing system

Today's drainage monitoring system is not automated. So, whenever there is blockage it is difficult to figure out the exact location of the blockage. Also, early alerts of the blockage are not received [2]. Hence detection and repairing of the blockage become time consuming. It becomes very inconvenient to handle the situation when pipes are blocked completely [1]. Due to such failure of drainage line people face a lot of problems. We have solved these problems by using machine learning methods in our proposed work.

III. Proposed system

Our proposed system proposes the following features.

- Detects the specific drain where the blockage occurs.
- Immediate information of the blockage.
- The system governs the flow of sewage from the pipes.
- Get the prior alerts of blockages and locate them using IOT & ML
- Use of flow sensors to detect the variations in the flow.

IV. Block Diagram and Its Working

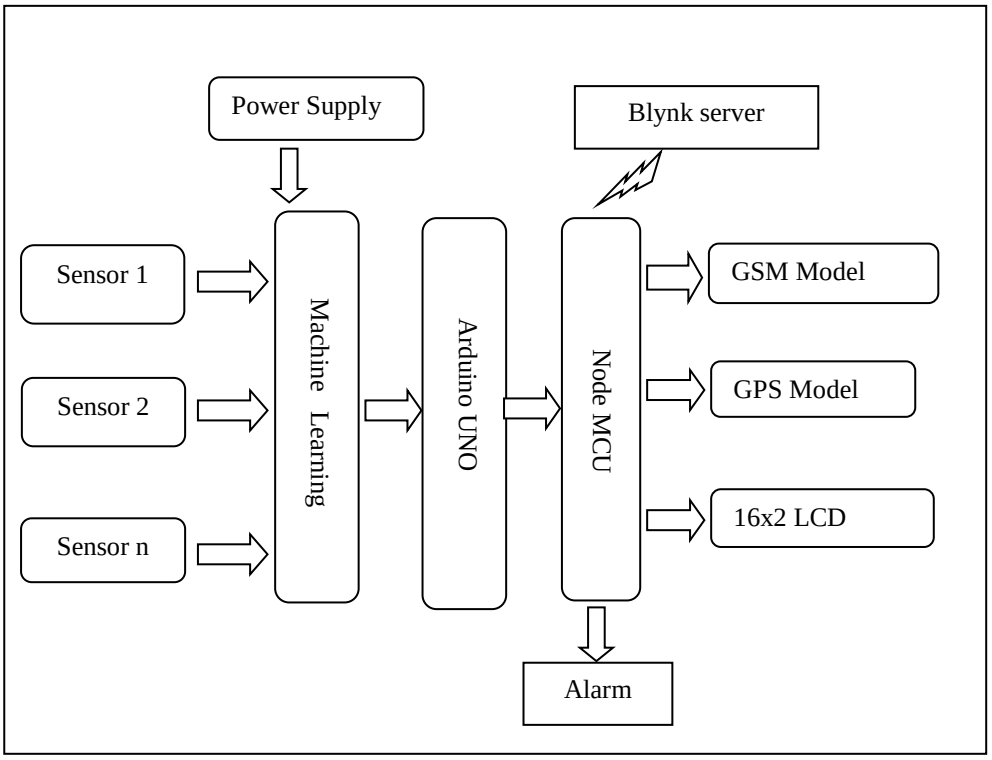

Fig.1: Block Diagram of Smart Drainage Monitoring and Controlling System

The Fig. 1 shows the system block diagram of the proposed system, the network consists of GPS sensors nodes, Network coordinator, and Cloud storage[2]. A remote graphical user interface is further developed to examine the information and analysis results. Based on the proposed system architecture, sensor nodes response to sample the physical parameter to measurable voltage level through corresponding sensors. Machine Learning approach is used to find the early blockages in pipes. The Blynk server is then used to transfer these acquired data to the organizer via a wireless connection. Coordinator is focusing to constellation maintenance, collect data and transfer the reassemble information to the cloud storage using the Wi-Fi through mobile internet.

V. System Specification

1. Sensor
2. Arduino UNO
3. Node MCU
4. LCD
5. GPS Module
6. GSM Module
7. Blynk Application

NodeMCU

NodeMCU is an open source LUA based firmware developed for ESP8266 wifi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. NodeMCU Development board.

Node MCU

The NodeMCU is a board which is used to take the readings from the flow sensor when the power supply is given. NodeMCU here is connected to Wi-Fi which is used to send the notifications to the blynk cloud regarding the changes in the flow of sewage fluid.

Features

- Finally, programmable Wi-Fi module.
- Arduino-like (software defined) hardware IO.
- Can be programmed with the simple and powerful Lua programming language or Arduino IDE.
- USB-TTL included, plug & play.
- 10 GPIOs D0-D10, PWM functionality, IIC and SPI communication, 1-Wire and ADC A0 etc. all in one board.
- Wi-Fi networking (can be used as access point and/or station, host a web server), connect to internet to fetch or upload data.
- Event-driven API for network applications.
- PCB antenna.

GPS Sensor

GPS utilizes satellites to detect the location of any GPS monitoring chip item, including cars, humans and pets.This functions independently of atmospheric factors and offers spatial details in real time.

GPS Sensor

Working of GPS sensor

One of the global positioning system (GPS) devices ultilizes data from satellites to locate a specific point on the Earth in a process named trilateration. Meanwhile, a GPS receiver measures the distances to satellites using radio signals to trilaterate. And trilateration is similar to triangulation, which measures angles, depicted in this illustration (Tim Gunther, 2020). GPS modules contain tiny processors and antennas that directly receive data sent by satellites through dedicated RF frequencies. From there, it'll receive timestamp from each visible satellite, along with other pieces of data. If the module's antenna can spot 4 or more satellites, it's able to accurately calculate its position and time.

Blynk Application

Blynk was designed for the internet of things. It can control hardware remotely, it can display sensor data, and it can store data, visualize it and do many other cool things.

There are three major components in the platform:

- Blynk app - allows to you create amazing interfaces for your projects using various widgets we provide.
- Blynk server - responsible for all the communications between the smartphone and hardware. You can use our blynk cloud or run your private blynk server locally. Its open-source, could easily handle thousands of devices and can even be launched on a raspberry pi.
- Blynk libraries - for all the popular hardware platforms - enable communication with the server and process all the incoming and out coming commands.

Features of Blynk Application

- Similar API & UI for all supported hardware & devices
- Connection to the cloud using:
- Wi-Fi
- Bluetooth and BLE
- Ethernet
- USB (Serial)
- GSM
- Set of easy-to-use Widgets
- Direct pin manipulation with no code writing
- Easy to integrate and add new functionality using virtual pins
- History data monitoring via Super Chart widget
- Device-to-Device communication using Bridge Widget
- Sending emails, tweets, push notifications, etc.

VI. Future work

Sensor networks are considered as the key enablers for the IoT paradigm [7]. This paper addresses all about smart and real-time Drainage monitoring system through IoT and ML applications. By using various sensors such as flow sensor, water level as well as blockage detection we can monitor the real time scenario of drainage system by detecting the problems in drainage system. In the future, we plan to implement automated system for removing of blockages by using Artificial Intelligence [8].

VII. Conclusion

Underground drainage monitoring is challenging problem [4]. This work proposes 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 flow 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. By using this project, we can reduce the man power and time consumption to verify the manhole blocking and underground drainage pipe lines and also avoids the hazards. If the person in charge and doesn't have a smart phone to access the blynk application or he/she unable to check email regularly, we can send the notification through SMS alert, but we not added this SMS module to our project which is the limitation.

References

[1] Tushar Pathak,Sanyogita Deshmukh , Pooja Redd and Prof H. P. Rewatkar "Smart Drainage Monitoring and Controlling System Using IOT", *International Journal of Research in Engineering and Science (IJRES) ISSN (Online): 2320-9364, ISSN (Print): 2320-9356 www.ijres.org Volume 9 Issue 7 ǁ 2021 ǁ PP. 23-29*

[2] K.Viswanadh, P.Rojitha,S. K.Khadija,S.M.S.P.C.Venkataraju,P.Nagamani, "Under Ground Drainage Monitoring System Using IoT", *Journal of Emerging Technologies and Innovative Research (JETIR), April 2019, Volume 6, Issue 4 , www.jetir.org (ISSN-2349-5162).*

[3] Gaurang Sonawane , Chetan Mahajan , Anuja Nikale , Yogita Dalvi , "Smart Real-Time Drainage Monitoring System Using Internet of Things", *Iconic Research and Engineering Journals (IRE), Volume 1 Issue 11 (ISSN:24568880, 2018.*

[4] Yash Narale, Apurva Jogal, Himani Choudhary, S. P Bhosale" Underground Drainage Monitoring System Using IoT", *International Journals and Research Ideas and Innovations In Technology, ISSN: 2454-132X, Volume 4, Issue 1, 2018.*

[5] Prof S. A. Shaikh1, Suvarna A. Sonawane," Monitoring Smart City Application Using Raspberry PI based on IoT", *International Journal of Innovative Science, Engineering & Technology, Vol 5 Issue VIL, July 2017.*

[6] Prof Muragesh SK, Santhosha Rao, "Automated Internet of Things For Underground Drainage and Manhole Monitoring Systems For Metropolitan Cities", *International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 4, June 2015.*

[7] Lazarescu, M.T., "Design of a WSN Platform for Long-Term Environmental Monitoring for IoT Applications", *Emerging and Selected Topics in Circuits And Systems, IEEE Journal on, vol.3, no.1, pp.45, 54, March 2013.*

[8] Meenakshi Devi, P. Venkatesan, M. and Duraiswamy, K. "Reversible image authentication with tamper localization based on integer wavelet transform", *International Journal on Computer Science and Information Security, Vol. 6, No. 2, pp.67-74, 2009.*

[9] S.Russia, Dr.R.Anita, K.Murugan "Improving the Accuracy of Intrusion Detection Systems in Mobile Adhoc Network Using Fuzzy logic Method", *International Journal of Applied Engineering Research (IJAER), Vol.10 Issue 7 17933-17950, 2015.*