SSRG International Journal of Electronics and Communication Engineering
ISSN: 2348 – 8549 /doi:10.14445/23488549/IJECE-V8I1P106
Volume 8 Issue 1, 28-31, January 2021

Advanced IOT Solutions to Monitor Vehicular Movement in Flooded Underpass

Jayanthi M [#1], Shripad[*2], Sindhu [#3], Akshay Rao [#4] , Rushab [#5]

[#1]*Associate Professor ,ECE ,New Horizon College of Engineering*
[#2-5]*Student ,ECE ,New Horizon College of Engineering*
Bangalore, India

Abstract: *In recent years, humans and other living things face problems due to rapid population growth. Also, there is no proper infrastructure, which leads to various other problems like underpass water logging. In case of intense rain, underpasses are quickly flooded with water, which can cause serious situations for passing vehicles. Also, a substantial vehicle traffic problem is experienced in underpasses. This inadequate drainage mechanism and poor design to filter the rainwater to the ground. This paper introduces an IOT based solution to monitor and control heavy traffic in the underpass. The main objective is to develop a framework that monitors the water level in the underpass by activating the significant signs.*

Keywords — *Internet of Things, sensors, Wi-Fi module, LCD, cloud architecture.*

I. INTRODUCTION

In-country like India, where escaping from the traffic is one of the major issues to the people. The Motorists rack their brains every time the sky opens up to figure out if there any underpass that en-route to their destination to escape from the traffic in the city. Suppose the underpass is flooded with water due to heavy rain.[1-2] No matter how good or bad the road is, if drivers choose the particular path, they have to wait a lot of time till the water drains or till the water is pumped up.

One such incident in Bangalore city witnessed has been described below: The incident on September 26th, 2014 is mainly due to the poor design, improper maintenance of the underpass, and inadequate drainage mechanisms. Almost fifty unsuspecting bus passengers stood dangerously very close to the disastrous watery end to the journey. Many people were trapped near Anand Rao's circle helplessly stared at an end. After much struggle, they were rescued by fire and emergency services. Eventually, they survived to ask hundreds of questions to the city's agencies for the situation to have taken place. They also questioned about the low maintenance record, underpass construction quality, and many more. Lessons are learned after the disaster situations that occurred year after year, the existing ones are redesigned, managed to maintain the record, and many more are planned across the city. The same scenario happened in various parts of India during the monsoon season.

Waterlogging in the nearby areas, blockage of stormwater, and backflow of the water also leads to spreading waterborne diseases like typhoid, cholera, and various infections such as amoebiasis and toxoplasmosis, glardiasis, etc.

Internet Of Things has become powerful technology that could replace humans based strains. IoT is also referred to as the Internet of everything. It consists of all web-enabled devices that collect the information using embedded sensors and send and process the data using processors and communication hardware for further visualization.

The rest of this paper is organized as follows: Section 2 discusses the related work, and Section 3 gives the problem statement and objective. Section 4 presents the proposed framework to develop a monitoring system in an underpass. Section 5 provides the results and discussion, and Section 6 provides the conclusions and suggests scope for future work.

II. RELATED WORK

In [3], the author presented and reviewed a paper on IoT. The authors have explained the various models and the importance of IOT. The author in [4] explained IOT based control and monitoring system to monitor the water. Ultrasonic sensors and microcontrollers have been used in their work to monitor the level of water. The drawback in this work is no mechanism has been introduced to move the water if it exceeds certain levels. In [5], the author proposed improving the quality of drinking water using IoT. The drawback is Sensed parameters are not fed to the cloud. In [6], the author has proposed the tremendous growth of the Internet of Things applications in smarter Life.

III. PROBLEM STATEMENT AND OBJECTIVE

During monsoon season, many underpasses are waterlogged. Most of the cities are facing the problem of underpasses getting flooded. These inoperable underpasses cause heavy traffic and pose a grave danger to pedestrians with dangerous diseases and infections. These factors negatively affect vehicle drivers as they contribute to stress, waste of time, and other health issues. The main objective of our project is

1. To provide the advanced solution to monitor the underpass water logging due to intense rain.
2. To display alert information to the road user which type of vehicle can pass in.
3. To upload warning messages to the cloud and make the status available to the public.
4. To monitor the situation in the underpass visually.

IV. PROPOSED FRAMEWORK

A. System Overview

Waterlogging in underpass [7] is a chronic problem, and vehicles find it difficult to navigate the roads. This project aims to understand the application of the Internet of Things in the underpass water logging management system. The block diagram of the proposed work is depicted in Fig 1. This system gives timely warning messages of flooding of the underpass. An LCD screen can be placed in front of the underpass to indicate which type of vehicle can pass in to avoid traffic congestion.

The overall system consists of hardware nodes, WIFI module, cloud architecture, and frond end devices. The methodology consists of 2 parts: IoT and Automation

1.IoT: - Internet of things is used to upload the data Using the NODE MCU Wi-Fi module. The data from the sensors are stored in the Things Cloud software.

2. Automation: -The automation part consists of an LCD screen and pump.

B. Hardware components used

- Node MCU ESP8266 Breakout Board
- Water level Sensor
- General Purpose Transistor NPN
- LED
- Resistor
- Buzzer
- Motor driver
- Breadboard

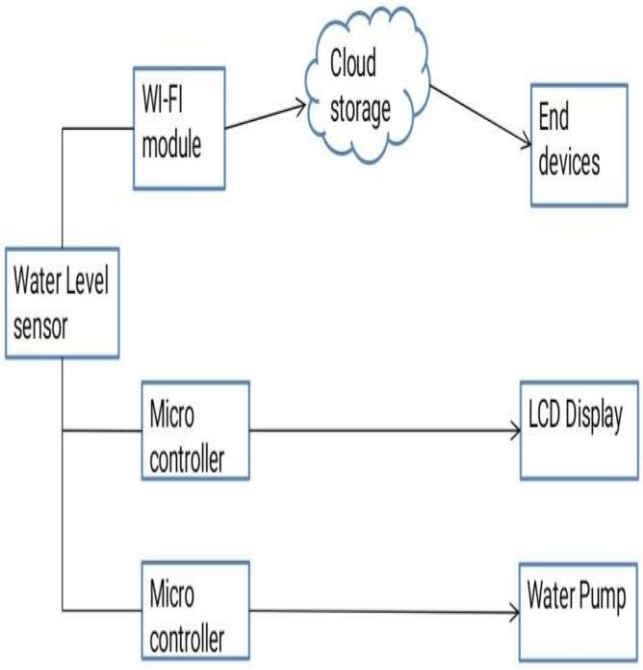


Fig 1. Underpass waterlogging system

C. Software Tools used

- Arduino IDE
- thingsio.ai

D. System Architecture

The input from the water level sensor is an analog input which is received by the Atmega 328p microcontroller, which works at a speed of 20MIPS and 20 MHz clock frequency and operates in the range of 2.7-5.5V and this information is further given to the LCD, which is placed at the location where vehicles can divert by avoiding the underpass if it flooded. The screen displays the messages by considering the data. To dispose of the underpass's accumulated water, we use the DC pump controlled by a WIFI module or a microcontroller, and the motor driver is used to turn ON and OFF the DC pump. The input from the water level sensor is uploaded to the Think Speak website by creating a channel with Node MCU's help [8-9], and the instructions are passed from the website to the motor driver to turn ON the DC pump.

E. Implementation

The flowchart of the proposed work is shown in Fig 2. First, Start the Initialization process: Read/Write and enable pins of the LCD is set. Input from the Water level sensor is initialized as an analog input, and a pin is allocated to it. Data from the water level sensor is collected and passed to the Atmega Microcontroller. Given the fact that the values derived from the sensor cannot be negative, the system loops back to collect data if sensor output is zero.

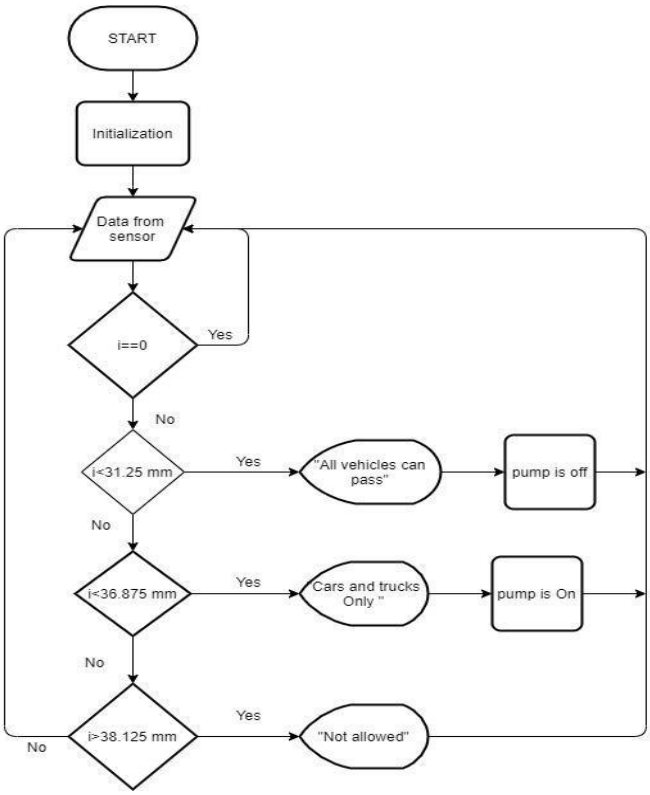
On the other hand, the LCDs a message “ALL VEHICLES CAN PASS” if the sensor detects water up to a height of 31.25mm. It displays “CARS AND TRUCKS ONLY” if the water level is between 31.25mm and 36.87mm. If the water level is beyond 36.87mm, the LCDs “NOT ALLOWED.” This loop repeats itself every 200ms. The pump is also turned ON by the Microcontroller if the level of water increases beyond 31.25mm. Until then, the pump is OFF.

V. RESULTS AND DISCUSSION

This proposed system monitors and analyses the traffic in the underpass. The data from the sensor is collected, and the data is passed to Microcontroller [10]. Using an LCD screen, the data is displayed. Also, this screen is placed in a higher location so the vehicles passing can see clearly. If the water level is more than the threshold, the motor pump is turned on. The motor can be tuned manually or automatically. The data is uploaded to think speak server using a Wi-Fi module

Based on the water condition level in the underpass [11], the LCD screen displays which type of vehicle can enter in. Road users can view the alert message from a faraway location through smartphones. This system can be interfaced with a DC pump to dispose of the accumulated water in the underpass and send the message to the respective authorities. Uploads the

warning messages to the Internet and make the status available for the public. The entire prototype and sample output are shown in fig 4 and 5. All the sensors are associated with the Wi-Fi module. This module needs the web. So here, Mobile information or Wi-Fi is



the passage for the cloud. After this, information sends to the cloud.

Fig 2. Flowchart of the proposed work

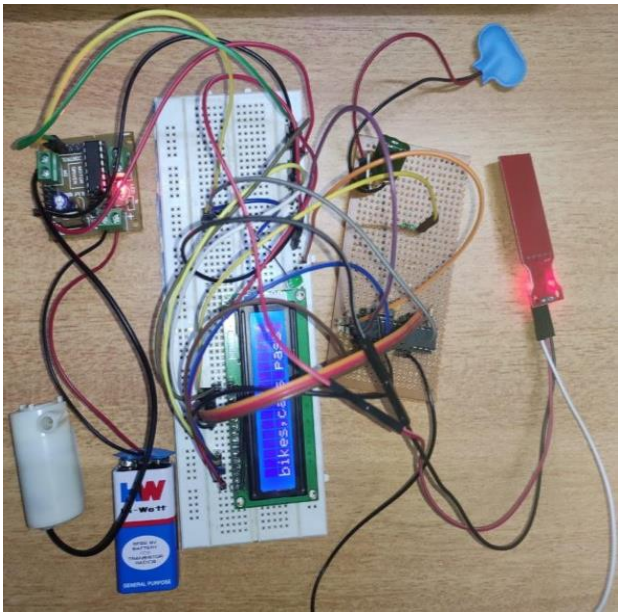


Fig 3. Underpass management system

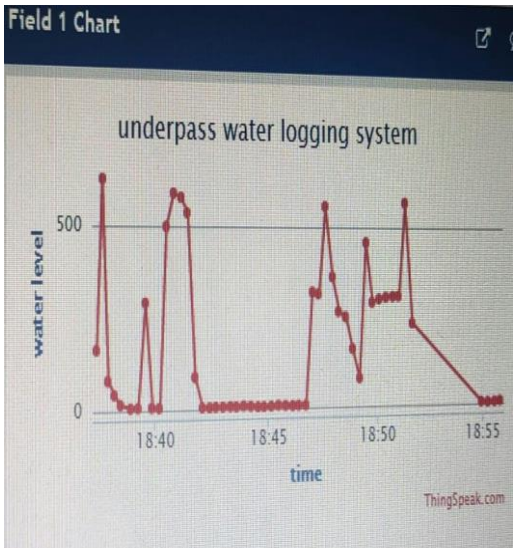


Fig 4-5. Proposed system output

VI. CONCLUSION

The implementation of underpass water level logging using IoT has been done. For the indication of the water level, an LCD has been used, making it easy for the user to identify whether the vehicle can pass. The alert messages or the warning messages are being provided for the user from the faraway distance through the mobile phones. The DC pump has been used to dispose of the water accumulated in the underpass due to heavy rainfall. The sensors are used to reduce the water problem and also to warn the users. The required information has been uploaded to the cloud so that anyone can access it with ease. The Internet has changed the size of Life involving virtual interaction. IOT has the potential to feature new dimensions

enabling smarter object communications. The project proposes a simple water level monitoring system with different levels indicated. It also signifies when the water level is below and above then the requirement. Future Work can involve the analysis of water level in a particular area so that water wastage is prevented.

REFERENCES

[1] Deccan Herald home page [online] Available: https://www.deccanherald.com/content/434220/underpass-par-water.html.,(2018)

[2] Abhishek Rameshbhai Patel, Hemal S. Parekh "Study of Stormwater Problem at Akhbarnagar Underpass (Ahmedabad)" in International Journal of Advance Engineering and Research Development (IJAERD), (2015) 1-4.

[3] Samiksha Sharma,A Review Paper on the Internet of Things., in International Journal of Engineering Research & Technology (IJERT), 5(23)(2017) 1-7.

[4] Pravallika, Devireddy Prathyusha, Srivasa Kumar,IOT based water level monitoring system with an android application, in International journal of recent and Innovation trends in computing and communication, 6(6)(2018) 94-97.

[5] Gowthamy J, Chinta Rohith Reddy, Pijush Meher, Saransh Shrivastava, Guddu Kumar.,Smart Water Monitoring System using IoT, in International Research Journal of Engineering and Technology (IRJET), 5(10)(2018) 1-4.

[6] Ujwala Kini H, Tejaswini,Internet of Things (IoT) A Gateway for Smarter Life,in International Journal of Engineering Research & Technology (IJERT), 6(13)(2018) 1-7.

[7] Kamal Patel, Khushboo Patel, Rajvansh Patel, Kalgi Trivedi, Storm Water Drainage for Underpass,in International Journal for Innovative Research Science & Technology, 3(09)(2017).

[8] N. Aishwarya, R. Akila, R. Gayathri, Mr. S. Dhamodharan., IoT Based Soldier monitoring System., in SSRG International Journal of Electronics and Communication Engineering, Special Issue, (2019) 23-27.

[9] Ali Al Dahoud, Mohammed Fezari,NodeMCU V3 For Fast IoT Application Development, (2018).

[10] Melchizedek I. Alipio∗, Jess Ross R. Bayanay, "Vehicle Traffic and Flood Monitoring with RerouteSystem Using Bayesian Networks Analysis., in 2017 IEEE 6th Global Conference on Consumer Electronics (GCCE 2017).

[11] Times of India homepage [Online] Available https://timesofindia.indiatimes.com/city/bengaluru/bbmp-banks-on-injection-wells-to-prevent-underpass-flooding/articleshow/73179057.cms., (2020).