WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

IMPLEMENTATION OF BOAT SENSING ON DRAINAGE SYSTEM AT MUVATTUPUZHA MUNCIPALITY

Ms. Aleena Rafeek[1], Ms. Ameena Sabeer[2], Mr. Anandu Sugathan[3], Mr. Sadhath Ali T N[4], Ms. Sonu Saju[5]

[1234]Pursuing B. Tech in Civil Engineering from APJ Abdul Kalam Technological University, Kerala, India [5]Assistant Professor, Department of Civil Engineering, Ilahia College of Engineering and Technology, Kerala , India

ABSTRACT-

Floods happen when a lot of water overflows and spreads out, causing a lot of damage. Many places around the world deal with floods every year due to heavy rain and poor drainage. The severity of floods and rainfall varies from place to place. Local authorities are important in reducing the impact of floods, especially in areas prone to folding. Informing communities about potential floods helps them prepare and be resilient. A BOAT system has been introduced to raise awareness in the community. This system, installed on a boat, uses water sensors and microcontrollers to detect water levels accurately. When authorities communicate with residents, it shows they care about their safety. This encourages people to take precautions seriously and work together during floods. The community can support each other during evacuations and recovery. An innovative solution in the drainage system helps people get timely information to protect themselves and their property.

Keyword: Arduino Uno328, Arduino Nano, Sensors, BOAT.

1.INTRODUCTION

The primary factors contributing to floods in India include continuous monsoon rainfall, reduced capacity of river channels to handle high flows, erosion of riverbanks and the accumulation of sediment in channel beds, inadequate natural drainage in flood-prone areas, cloudbursts, and various other meteorological elements. Urban floods, a new type of disaster, have been on the rise due to city expansion and changes in land use. Kerala has seen destructive floods in various regions, including the kannamaly flood in 2023, velloorkunnam flood in 2018, and kozhenchery flood in 2019, all of which were severe. Managing floods in India is complex and challenging. In 2018, Kerala experienced severe floods that resulted in a tragic loss of life, with more than 489 people reported dead. Unfortunately, some of these deaths were caused by a lack of timely flood information.

Fig 1. Flood on Muvattupuzha (2018)

1.1 Impact of Flood due to Lack of Alertness

- Businesses can be forced to shut down.
- People can be injured or killed.
- Can lead to illness and affect clean drinking water.
- Homes and properties can be flooded.

In Muvattupuzha and Ernakulam, the lack of timely communication of early warning information increases disaster risk. An efficient early warning system, like BOAT, can save lives and minimize damage by sharing flood-related information with downstream communities. The new BOAT, equipped with an Arduino UNO board and cost-effective sensor, accurately detects water levels and alerts the community when levels exceed safety limits. This technology safeguards low-lying areas and addresses safety concerns, reducing potential damage**.**

1.2 Aim

The aim of the study is to deploy a BOAT on the drainage system in Muvattupuzha Muncipality. Using Arduino Uno328, Arduino Nano, Audio Board and various other Microcontrollers.

1.3 Objective

- To evaluate the present scenario of the drainage system.
- Introduce the BOAT to drainage system using Arduino and Microcontrollers.
- To program the Arduino Uno328 and designing a model of BOAT.

1.4 Scope of the Study

- Develop and implement a BOAT sensing system for accurate water level detection within a 150- meter range.
- Provide alertness within the society.
- Minimize the loss of lives and property.
- As a future scope it has a potential to be utilized by incorporating a blockage detection sensor, gas and temperature sensor.

II. LITERATURE REVIEW

[1] Tushar Pathak (2022) conducted a study on Smart Drainage Monitoring and Controlling System using IOT. The research emphasizes the significance of drainage systems in Indian cities for cleanliness, safety, and health. Swiftly addressing leaks and bursts in the water distribution system is vital to prevent water loss. This project specifically concentrates on monitoring and managing underground and road-side drainage systems, as well as addressing safety concerns such as harmful gases, worker temperature, and blockages.

[2] Romer and F. Mattern (2021) conducted a experimental study on The Design Space of Wireless Sensor Networks. This paper summarizes a study on Wireless sensor networks are widely used in various applications, creating challenges in meeting hardware and software requirements. The research explores how this challenge impacts design choices for wireless sensor networks, supported by evidence that current applications occupy unique positions in the design space.

[3] K. R Charima Lakshmi (2022) conducted a study on Automatic Drainage Monitoring and Alert System using IOT. The journal recommends using smart technology for drainage monitoring to improve safety, efficiency, and cost savings. The goal is to create "SMART CITIES" by using smart sensors connected through IoT for sewage management. The main focus is on enhancing the traditional drainage monitoring process in sewage maintenance. A warning system will monitor flow, level, and toxic gas levels in the sewage pipeline, with updates displayed on a webpage. In case of overflow, the sewage will be redirected to another drain until manual maintenance is completed.

[4] Samiha Sultana (2022) conducted a study on An IOT based Drain Monitoring System with Alert Messages. The research focused on Bangladesh's drainage system, which causes flooding and unclean conditions due to blocked drains. The study suggests using a GSM and IoT alert system to send information to officials, preventing disasters. Sensors can detect sewage gas, measure sewage distance, and monitor water flow. When the water level surpasses a certain point, authorities receive a text message with GPS coordinates. Users can access real-time data online and adjust threshold values. This technology enhances community health by offering timely alerts and current information.

[5] Gunasekaran M & Pavitra S (2022) conducted a study on IOT Enabled Underground Drainage Monitoring System using Water flow Sensor. The journal focuses on preventing water leaks in sewer lines. Utilizing a sewer monitoring system with smart sensors and IoT technology can help detect and prevent gas leaks that can cause property damage. By using a water flow monitoring sensor, you can identify and repair leaky sewer lines. Strategically placing sensors in various locations can pinpoint the exact area of leakage. Water flow sensors, along with Arduino technology, can also measure the volume of water flow.

III. SYSTEM SPECIFICATION

3.1 Arduino Uno328

The Arduino Uno is a microcontroller board that is open source. It uses the ATmega328P microcontroller. The board has digital and analog input/output (I/O) pins that can connect to expansion boards (shields) and other circuits. It can be powered by a USB cable or a 9-volt battery, but it can handle voltages from 7 to 20 volts.

Fig 2. Arduino Uno

3.2 Arduino Nano

The Arduino Nano is a smaller version of the Arduino Uno, but it has the same features and connections. It is a microcontroller board that is open-source. The Arduino Nano has 30 male I/O headers.To power the board, you can use a 9v battery. It has flash memory and two processors, the Atmega328 and Atmega16U2.

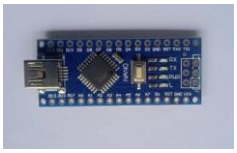


Fig 3. Arduino Nano

3.4 ISD1820 Audio Board

Two audio boards are installed on the boat system to send safety alert messages. They activate when the water level rises in the drainage network. One board announces the safe zone, while the other is for the excavation zone. Prior to making announcements, the desired sound must be recorded on the voice recorders. Each announcement lasts for 10 seconds on both boards and is accompanied by alarming systems.

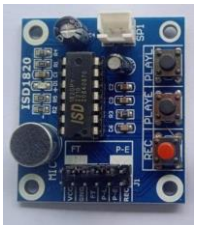


Fig 4. Audio Board

3.4 nRF24L01 Transciever

The nRF24L01 is a compact wireless transceiver operating in the 2.4 - 2.5 GHz ISM band. It includes components like a frequency synthesizer, power amplifier, crystal oscillator, demodulator, modulator, and Enhanced Shock Burst protocol engine.

Parameter	Value	Unit
Minimum supply voltage	1.9	V
Maximum output power	0	dBm
Maximum data rate	2000	kbps
Supply current in TX mode @ 0dBm output power	11.3	mA
Supply current in RX mode @ 2000 kbps	12.3	mA
Temperature range	-40 to +85	°C
Sensitivity @ 1000 kbps	-85	dBm
Supply current in Power Down mode	900	nA

3.5 Motor Drive L293D Model

The L293D is an IC for twin H-bridge motor drivers that amplifies current to power motors. It can handle up to 600 mA of bidirectional driving current at voltages between 4.5 V and 36 V. It is commonly used for driving inductive loads like relays, solenoids, DC, and bipolar stepping motors. Its main purpose is to independently control the direction of two DC motors.

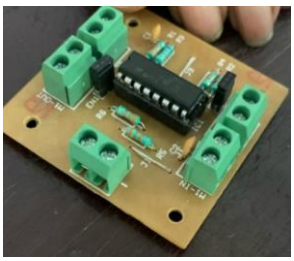


Fig 5. Motor Drive L293D

IV. METHODOLOGY

LITERATURE SURVEY

OBJECTIVE FORMULATION

EVALUATE THE SITUATION IN MUVATTPUZHA

SELECTING A SUITABLE LOCATION

ASSESING THE DRAINAGE INFRASTRUCTURE

(LENGTH, WIDTH,DEPTH)

OBTAINING THE EQUIPMENT FOR THE BOAT SYSTEM

MICROCONTROLLERS PROGRAMMING

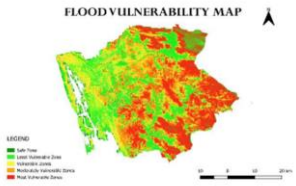
STARTED CONSTRUCTION OF WORKING MODEL & AUTODESK 3DS MAX

RESULT & DISCUSSION

CONCLUSIONS

V. DRAINAGE SELECTION & MANAGING OF EQUIPMENTS

The regions impacted by the flood are Perumbavoor, karukutty, Eloor, Kothamangalam, Muvattupuzha and Koothattukulam. This anticipated map will aid in effective planning and implementation of preventive measures.



Based on the flood vulnerability map, Muvattupuzha is the ideal location to implement BOAT in the drainage system. This low-lying area experiences rising water levels with minimal rainfall, making it crucial to integrate BOAT for enhanced community protection.

5.1 Evaluation of Drainage System

The drainage system chosen is in excellent condition, with no slopes or ditches. This provides a secure environment for carrying out BOAT smoothly. It is situated in ward 16 (Petta) under the Muvattupuzha Municipality.

Fig 6. Selected Location & Drainage

Assessing the drainage infrastructure;

- The drainage measures 280 meters in length.
- The drainage measures 1.30 meters in width and depth.

Population survey;

There are a total of 76 houses in this area, with each family consisting of either 4 or 3 members.

5.2 Evaluation of functional prototype

It is crucial to test and assess the model's functionality by comparing sensor data with goals. Verifying Arduino Uno 328 and Arduino Nano is necessary. Thoroughly testing the microcontroller code is crucial. Evaluating water level sensors is necessary. Checking equipment and component integration is important. Testing the model in different scenarios and conditions is essential. Programming Arduino Uno 328 and Arduino Nano is crucial for customizing their behavior in specific electronic projects.

VI. FLOW CHART

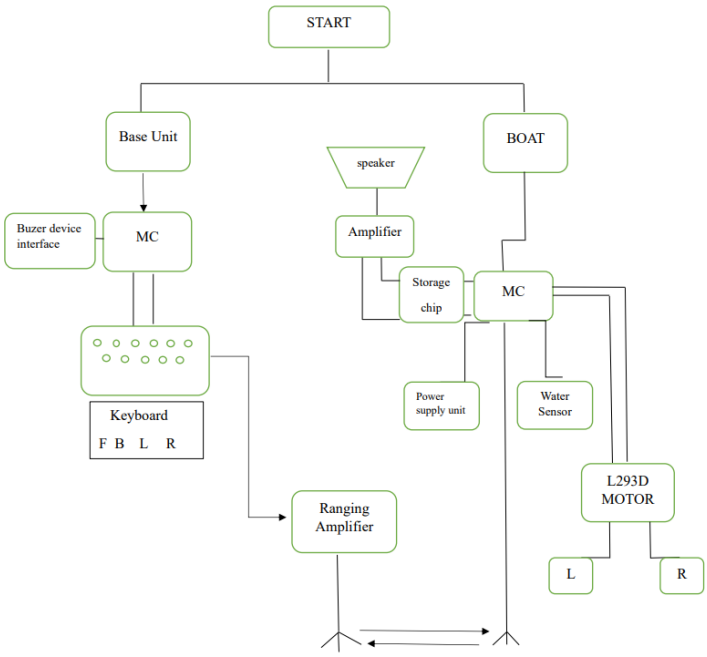


Fig 6. Proposed System

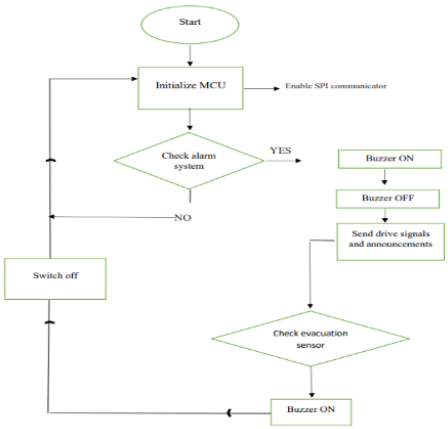


Fig 7. Flow Chart of Transmittor

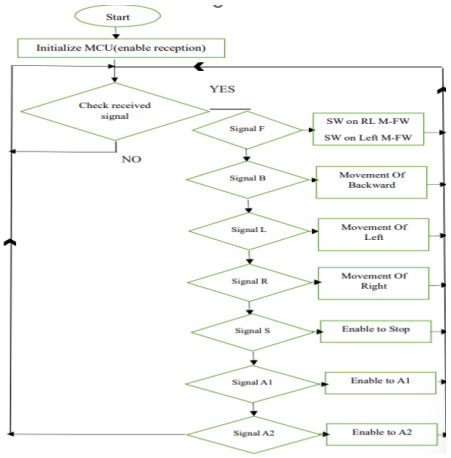


Fig 8. Flow Chart of Reciever

VII. LOCATION SKETCH

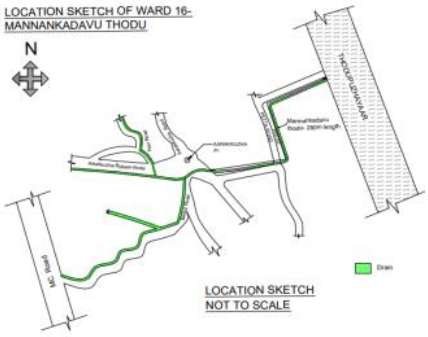


Fig 9. Location Sketch

VIII. AUTODESK 3DS MAX VIEW

Fig 10. Base Station

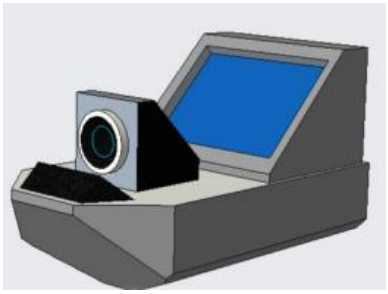


Fig 11. Boat System

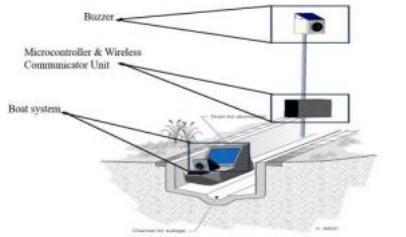


Fig 12. Boat System Site View

IX. FUTURE SCOPE & CONCLUSION

7.1 Future Scope

- Can be used for detecting Blockage using sensors.
- Can be used for detecting harmful gases.
- Can be used for detecting temperature.
- Can be also used for sewage cleaning by implementing automate sewage cleaner system.

Conclusions

The project aims to enhance safety during floods or rising water levels in drainage systems by addressing the lack of awareness that has led to loss of lives and property. We used a flood vulnerability map to choose Muvattupuzha as our project site and selected an appropriate drainage system. Using Arduino Uno 328 and Arduino Nano, we constructed a functional model and placed sensors within a 100-meter radius to monitor water levels. An Audio board ISD1820 was integrated for alerts when the water level surpasses the safe threshold, prompting residents to evacuate. Our goal is to reduce the loss of lives and property through timely and precise information.

REFERENCES

[1]. Arulananth T S, Ramya laxmi G, Renuka K (2019), Smart Sensing and Arm Based Drainage Monitoring System, *International Journal of Innovative Technology*, Volume 9, (12), 132-140.
[2]. Debaprasad D, Das G (2022), Artificial Intelligent based Drainage System, *International Journal of Science,* Volume N.o 5, (6), 200-215.
[3]. Dr. Gunasekaran M, Pavitra S, Priyanka R, Reeva M (2019), IOT- Enabled Underground Drainage Monitoring System Using Water Flow Sensor, *International Research Journal of Innovative Technology*, Volume N.o. 6, (3), 100-150.
[4]. K.R Chairma Lakshmi, B. Praveena (2022), Automatic Drainage Monitoring and Alert System Using IOT, *Springer Journal*, Volume N.o 336, (12), 747-758.
[5]. Romer, F. Mattern (2019), The Design Space of Wireless Sensor Networks, *Commun. And Networks,*Volume N.o 11, (6), 500-512.