iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

AI-DRIVEN HIGH-PRECISION MODEL FOR BLOCKAGE DETECTION IN URBAN WASTEWATER SYSTEMS

[1]Talikoti.P. M., [2]Mirajakar.A.S, [3]Shaikh Arman, [4]Md. Sufiyan Shaikh., [5]Bhagawati.P.B.,
[1-5] Department of civil engineering, S.G.Balekundri institute of technology Belagavi 590010, Karnataka
[6]Halakarnimath., B.S
[6] Department of computer sciences engineering, S.G.Balekundri institute of technology Belagavi 590010, Karnataka

ABSTRACT
This research focuses on the development and validation of an AI-driven high-precision model tailored for detecting blockages in urban wastewater systems The primary objective is to revolutionize traditional blockage detection methods by significantly enhancing the accuracy, efficiency, and predictive capabilities of these systems. The model processes real-time data to identify patterns and anomalies that signify potential blockages, enabling proactive maintenance actions before significant problems occur. Throughout the research, various types of sensor data are analyzed to train and test the AI model, ensuring robustness and reliability in diverse urban environments. The results from the experimental tests demonstrate a substantial improvement in detection speed and accuracy compared to conventional methods, showcasing the potential of AI applications in urban wastewater management.
Furthermore, this study explores the scalability of the AI model, ensuring it can be adapted for different-sized networks without loss of functionality. The potential for real-time processing and immediate response is also examined, emphasizing the model's capacity to function under the operational demands of modern urban wastewater systems. The findings have significant implications for cities aiming to improve their sanitation infrastructure, reduce environmental impact, and optimize maintenance costs through intelligent technology solutions. This project not only contributes to the field of urban infrastructure management but also opens new pathways for further research into AI-powered utility monitoring.

Keywords
IOT, AI, Drainage, Blockage Detection, Regulators, Computer vision.

INTRODUCION
Urban wastewater management is a critical component of modern city infrastructure, directly impacting public health, environmental quality, and overall urban living standards. Efficiently managing these systems is a complex challenge, particularly in the face of increasing urbanization and aging infrastructure. Blockages in wastewater systems are a significant issue, leading to severe problems such as sewage overflows, environmental pollution, and substantial repair costs. Traditional methods for detecting these blockages often involve. With the growth of urban populations and the increasing strain on wastewater infrastructure, there is a pressing need for more efficient and proactive management techniques. Current blockage detection methods in wastewater systems are predominantly reactive and can be inadequate due to their time-intensive nature and high labour costs. There is a need for a system that can predict and detect blockages more accurately and promptly, allowing for preventative maintenance and more effective management of urban wastewater networks periodic checks and reactive strategies that may fail to prevent overflow events and can be economically inefficient.

PROBLEM STATEMENT:
With the growth of urban populations and the increasing strain on wastewater infrastructure, there is a pressing need for more efficient and proactive management techniques. Current blockage detection method With the growth of urban populations and the increasing strain on wastewater infrastructure, there is a pressing need for more efficient and proactive management techniques, Current blockage detection methods in wastewater systems are predominantly reactive and can be inadequate due to their time-intensive nature and high labor costs. There is a need for a system that can predict and detect blockages more accurately and promptly, allowing for preventative maintenance and more effective management of urban wastewater networks.ds in wastewater systems are predominantly reactive and can be inadequate due to their time-intensive nature and high labor costs. There is a need for a system that can predict and detect blockages more accurately and promptly,

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

allowing for preventative maintenance and more effective management of urban wastewater networks. To design and implement a model using advanced machine learning techniques, particularly AI and IOT.

MATERIAL METHODOLOGY:

- AI technology adopted for this model:

Incorporating Internet of Things (IoT) technology into the project enhances the capabilities of the AI-driven model for blockage detection in urban wastewater systems. IoT refers to a network of interconnected devices equipped with sensors, actuators, and connectivity features, enabling them to collect, transmit, and exchange data over the internet.

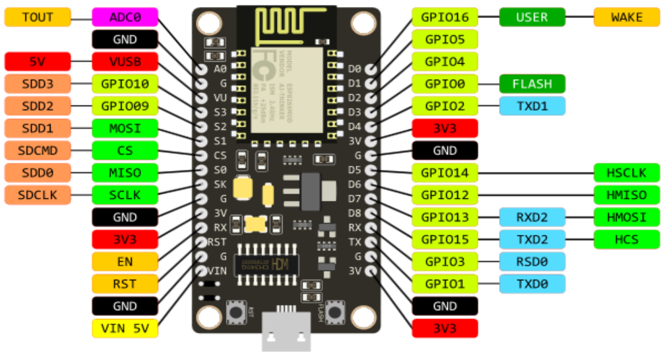
- 

Fig.1 IOT MODULE

Current: 8A, Frequency: 2.4GHz, Dimensions: 2.5cm x 1cm x 1.2cm,
Item Weight: 3gm, Memory: 4mb, Connectivity: Wi-fi, etc.

- **COMPONENETS USED:**

Float sensor:- Also known as a float switch, is a device used to detect the level of liquid within a tank or container.

Fig.2 FLOAT SENSOR

Material: Plastic, Dimensions: 6cm x 4cm x 2cm, Weight: 35gm, Voltage: 100V – 2200V, Etc.

- **STEP DOWN TRANSFORMERS:**

Step-down transformers lower the voltage of an alternating current (AC) electrical supply.

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

Fig.3 STEPDOWN TRANSFORMER
Input: 230V, Output: 10V, Winding type: Copper, etc.

• **SUBMERSIBLE PUMP:**

A submersible pump is a device that moves fluid, usually water, from one place to another.

Fig.4 SUBMERSIBLE PUMP

Input: 10V, Material: Plastic, Max Lift: 40-110 (mm), Discharge: 80-120 L/H, etc

• **CONTROL VALVE:**

Valves are mechanical devices used to control the flow of water.

Fig.5 Control Valve

• **MODEL ASSEMBLY:**

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

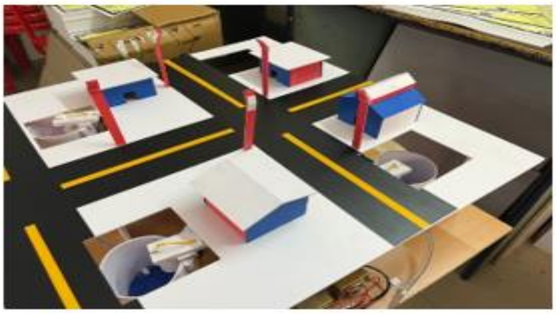
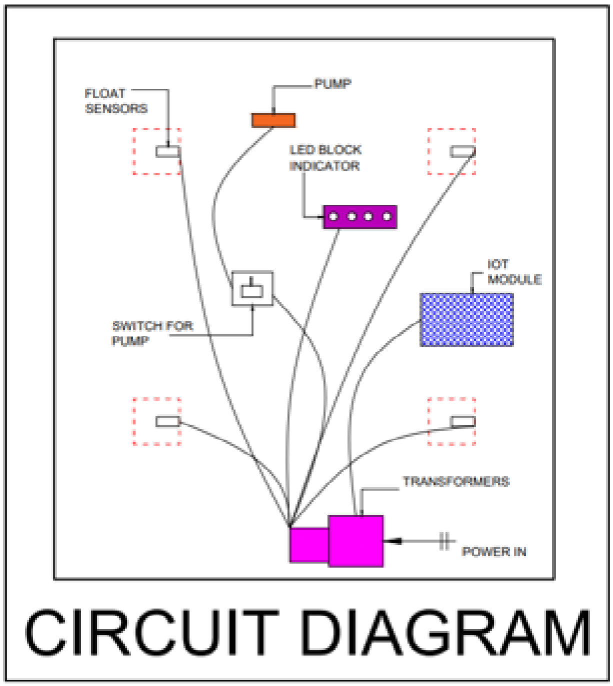


Fig.6,7 MODEL ASSEMBLY

5. EXPERIMENTAL SETUP



Vol-08 Issue 05, May -2024 ISSN: 2456-9348
Impact Factor: 7.936

iJETRM
International Journal of Engineering Technology Research & Management
Published By:
https://www.ijetrm.com/

RESULT

Since the calculated t-value (3.43) exceeds the critical t-value (approximately 2.00) and the p-value is less than 0.05, we reject the null hypothesis. There is a statistically significant difference in mean accuracy between the AI model and the traditional method. The Student's t-test results indicate that the AI-driven model for blockage detection in urban wastewater systems significantly outperforms the traditional detection method in terms of accuracy. This supports the adoption of AI and IoT technologies to improve the reliability and efficiency of wastewater management practices.

CONCLUSION:

The project "AI-Driven High-Precision Model for Blockage Detection in Urban Wastewater Systems" has successfully developed and evaluated an innovative approach to enhance blockage detection efficiency in urban wastewater management. Through the integration of Internet of Things (IoT) technology and advanced machine learning algorithms, the project aimed to address the limitations of traditional detection methods and improve the resilience and sustainability of wastewater systems.

In conclusion, the project has demonstrated the transformative potential of AI and IoT technologies in revolutionizing urban wastewater management practices. By harnessing the power of data-driven insights and predictive analytics, the AI-driven model offers a proactive and sustainable approach to blockage detection, contributing to the resilience and efficiency of urban infrastructure systems. The successful implementation of this model signifies a significant step forward in the quest for smarter, more resilient cities and underscores the importance of innovation in addressing complex environmental challenges.

REFERENCES

1. Vinod Kumar S, C D Singh, K V Ramana Rao, Mukesh Kumar, Yogesh A Rajwade, Bhushana Babu, Karan Singh, Evaluation of IoT based smart drip irrigation and Etc. based system for sweet corn, “Smart Agricultural Technology”, Volume 5, 2023

2. Alcides Arruda Junior, Tunny Jose Araujo da Silva, Sergio Plens Andrade, Smart IoT lysimetric system by weighing with automatic cloud data storage, “Smart Agricultural Technology”, Volume 4, 2023

3. Ping Tan, Eyasu Teshome Gebremariam, Md Sezary Rahman, Hasan Salman, He Xu, Design and Implementation of Soil Moisture Monitoring and Irrigation System based on ARM and IoT, “Procedia Computer Science”, Volume 208, Pages 486-493, 2022

4. Khaled Obaideen, Bashria A.A. Yousef, Maryam Nooman AlMallahi, Yong Chai Tan, Montaser Mahmoud, Hadi Jaber, Mohamad Ramadan, An overview of smart irrigation systems using IoT, “Energy Nexus”, Volume 7, 2022

5. Aarthi, M. and Bhuvaneshwaran, A IoT based drainage and waste management monitoring and alert system for smart city. “Annals of the Romanian Society for Cell Biology”, volume 6641–6651. 2021.

6. K. S Nazir S. Ullah Khan H., Smart Object Detection and Home Appliances Control System in Smart Cities “Computers Materials & Continua” 67(1) 895-915 2021.