IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

IOT Based Smart Drainage For Smart City

Prof. Mrs C.M.Hajare[1], Suyog Narayan Mali[2,] Snehal Chandrakant Shitole[3], Pallavi Shankar Ballal[4], Chetan Sambhaji Bajantri [5]

Dept. of Civil Engineering (Diploma), AITRC, Vita, Maharashtra, India[1]

Students, Civil Engineering, AITRC, Vita India [2 to 5]

Abstract : With the technological advancements, every application from our day to day life is becoming Internet-oriented, leading to the concept of Internet of Things (IoT). Various IoT devices and applications can be combined together for making a Smart City where smart drainage system is essential. However, solid wastes from groundwater flowing through the drainage system can create significant obstruction to its unrestricted flow, thereby causing overflows and profound environmental pollution. Thus, it is essential to manage these solid wastes effectively so that they do not obstruct the way of the drainage system. There have been few isolated works focusing on underground drainage monitoring or drainage system management only.

INTRODUCTION

A remarkable technological innovation of modern science is the Internet of Things, which refers to an interconnected network among various physical objects/devices. Smart City is aimed to manage different resources of a city electronically in an efficient manner and establish a significant connection between the urban community and urban infrastructure. An essential part of a sustainable environment of a city is a healthy drainage system where the excess surface water is being removed from an area naturally or artificially to provide a hygienic environment. A healthy drainage system is strongly associated with an effective waste management system. Managing wastes that create blockage inside drainage system through manual intervention is time consuming and takes too much effort. An automation of such system would result in a smart drainage management system that would direct towards improving quality of life of urban community.

METHODOLOGY

1. A cost-effective automated drainage management system concerning how drain clogs could be detected in the sewage pipelines using acoustic sensors through the WSN platform so that immediate actions can be taken.
2. The design and implementation of an IoT based smart manhole monitoring system using IoT that will generate an alarm based on the status (open lid, overflow etc.) of the manhole
3. A new intelligent approach for recognizing multi-featured objects using optical sensor based technology for processing solid wastes.
4. A monitoring system of dustbins by using a unique ID where all dustbins are interconnected through an Android App which sends a message to the concerned people when the bins are full]

DRAWBACKS

1. There have been individual solutions but none of the works focus on both the underground drainage mechanism and the drainage waste management system.
2. There are many solutions regarding drainage systems that mainly concerns how a drainage system is managed if any overflow occurs, without solving the root cause of overflow (i.e. waste materials).
3. The need for a drainage management system along with its waste management system in urban areas is inevitable, especially in a under-developed countries.
4. Manually handling these systems is often time-consuming and requires too much effort (human labor to collect waste that creates obstruction in the drainage system)

OBJECTIVE

The goal is to solve the specific source of overflow and effectively manage it by proposing an IoT-based smart drain Management solution for a smart city.

Proposed System:

Conceptual Features

Target Feature:- To prevent the clogging of drains using IoT so that it does not lead to drainage overflow and further inconvenience. This is achieved by considering all types of sources (roadside drains, infrastructure- home, industry, etc.) and their drainage mechanisms leading to the proposal of an integrated solution.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

A. Additional Feature:-

1. To manage different waste materials efficiently using IoT that clogs the drainage system. This is achieved by

a. Collecting all types of materials are sorting them using a smart sorting system.

b. An associated database with this sorting system will record the type and amount of incoming materials of a particular area.

c. The sorted materials are packaged separately, which notifies various organizations that can further process these materials for recycling, fertilizer production, etc.

d. There will be another database associated with this packaging system that will generate monthly/weekly/yearly reports regarding the amount and type of outgoing packaged materials to different organizations.

System Architecture

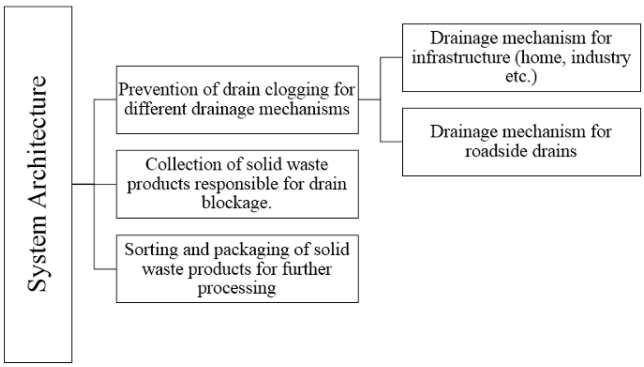

Fig 1. Flow diagram for system architecture.

Prevention of drain clogging for different drainage mechanisms

A. Drainage mechanism for infrastructure:

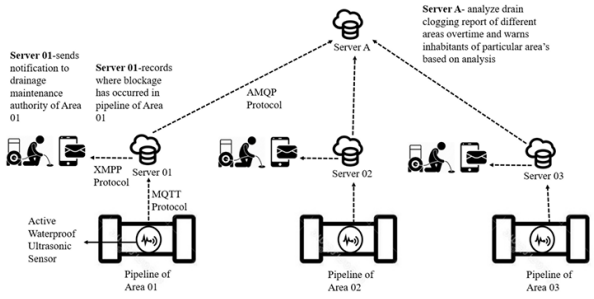

Fig 2. Drainage mechanism for infrastructure.

B. Drainage mechanism for roadside drain blockage

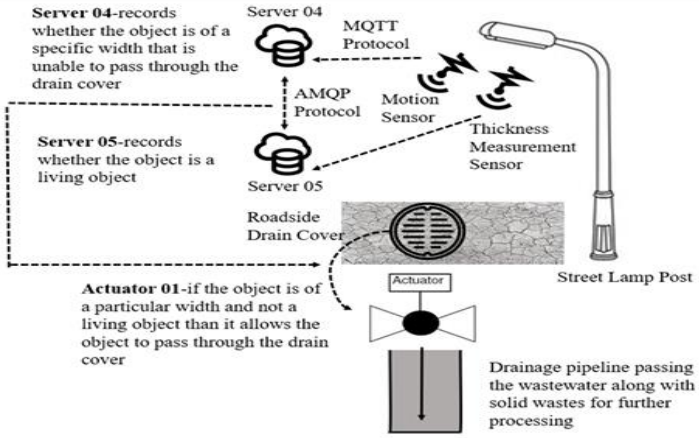

Fig. 3 Drainage Mechanism for Road Side Drain

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

C. Collection of solid waste products responsible for drain blockage

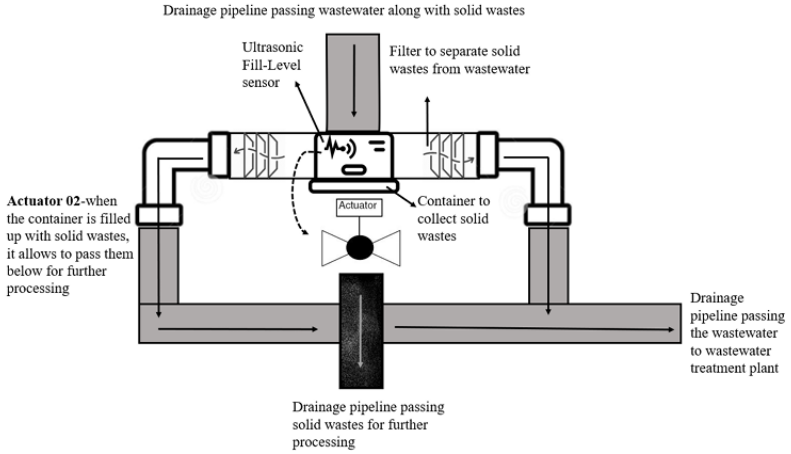

Fig. 4 Collection of solid waste products responsible for drain blockage

D. Sorting and packaging of solid waste products for further processing

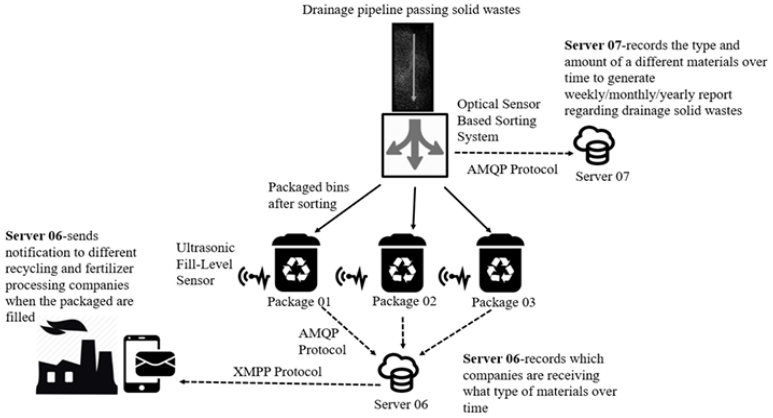

Fig 5. Sorting and packaging of solid waste products for further processing

COMBINED SYSTEM

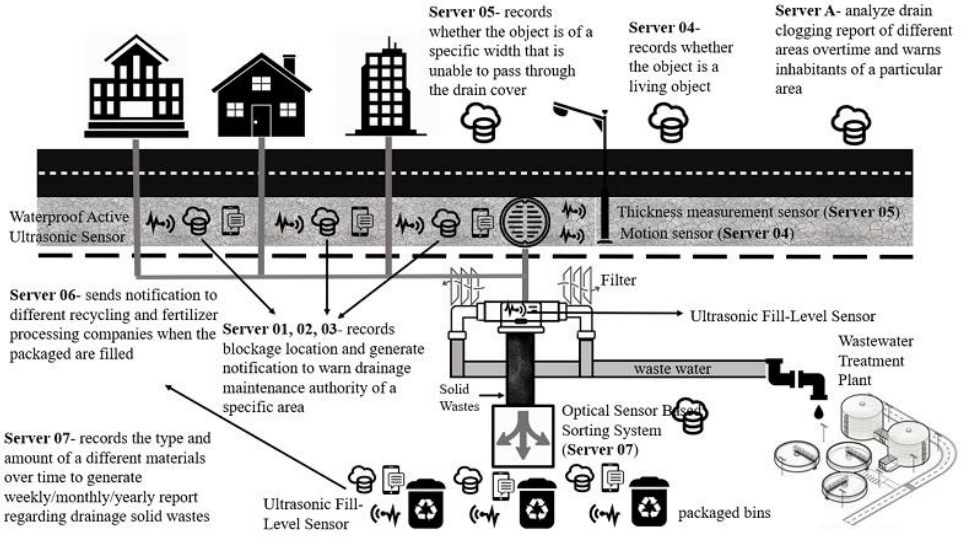

Fig 6. The proposed complete IoT based drainage management system

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

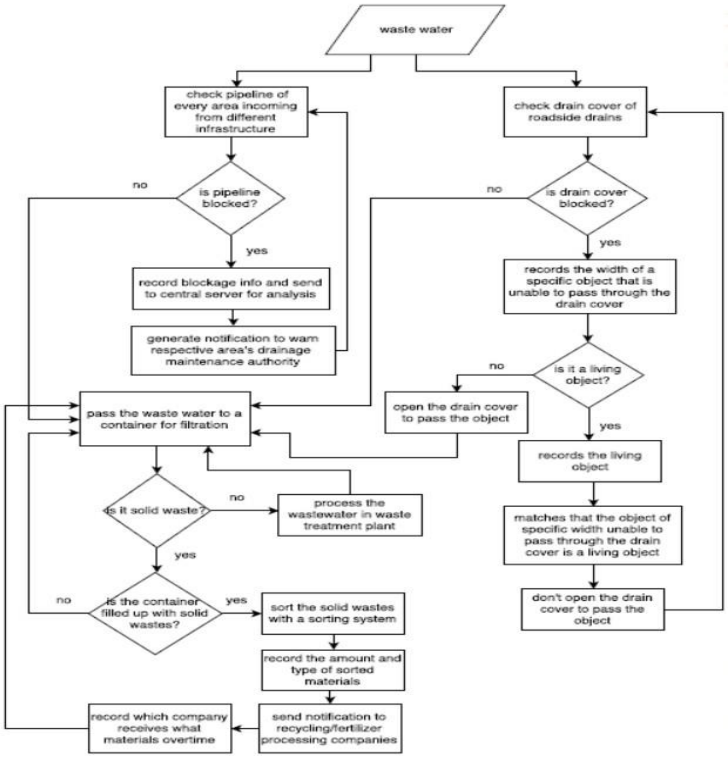

Fig 7. A flow diagram for the working procedure of the system.

FUTURE SCOPE

1. Proposing a comprehensive smart solution for both surface drainage mechanism and waste management system.
2. Detailing the crucial components of the proposed system.
3. Specifying the methods for preventing and managing the solid wastes that are responsible for creating blockage inside drainage pipelines and drain covers.
4. Emphasis on the fact that if the root cause for drain clogging can be solved, the city can be protected against the consequences of environment pollution

CONCLUSIONS & FUTURE WORK

In conclusion, an IoT-based smart drainage system plays a pivotal role in transforming urban water management in smart cities. By leveraging real-time data, predictive analytics, and automated responses, it enhances flood management, optimizes maintenance, and ensures efficient storm water and wastewater management. The system not only reduces operational costs but also improves public safety by preventing flooding and waterborne diseases. Moreover, it contributes to sustainability by managing resources like rainwater and minimizing environmental impact. Through continuous monitoring and proactive interventions, the system ensures the resilience and longevity of urban infrastructure. With increased citizen engagement and transparency, smart drainage systems foster a more eco-friendly, efficient, and safe urban environment. Ultimately, these systems are crucial for building smarter, more sustainable cities that are capable of adapting to the challenges posed by rapid urbanization and climate change.

1. An essential smart city component is the smart drainage management system that aims to provide an effective and effortless systematic method to preserve a healthy environment.
2. A comprehensive system design has been proposed for such a smart drainage management system that collectively considers drainage mechanism for both roadside drains and infrastructures, including a mechanism for drainage waste management.

Future Work: - To practically implement the system according to the design. To perform an experimental analysis in order to bear significant contribution in preserving a healthy environment of the urban community.

\

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

National Level Conference – AITCON 2K25

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 12, Special Issue 1, March 2025

Case Studies and Real World Implement:

Singapore:
Singapore's smart city initiatives include the use of sensors for flood prevention. The city has implemented a system that uses real-time data on rainfall, water levels, and drainage conditions to predict potential flood events and mitigate them proactively. A data-driven approach helps optimize drainage management in urban areas prone to heavy rainfall.

Amsterdam:
Amsterdam has been using smart sensors in its storm water management system. The IoT-based drainage system is integrated with the city's climate adaptation strategy, providing real-time monitoring of sewer water levels and detecting any irregularities that may signal potential flooding.

New York City (USA):
In New York, IoT sensors are installed in the city's drainage infrastructure to monitor the flow and pressure of stormwater. The data helps city officials to better plan for extreme weather events like hurricanes and heavy rainfalls, which are increasingly becoming common due to climate change.

Chennai (India):
Chennai has adopted a pilot project that uses IoT-based smart water sensors to monitor the health of the city's drainage system. This initiative aims to reduce flooding, water logging, and sewer backups by ensuring timely detection of blockages or system failures.

REFERENCES

[1]. Smart Drainage System Using IOT : Kamal Sahoo, Janhvi Tambe, Shravani Patil, Abhishek Mathpati, Mrs. Prachi Kalpande Student, hdormation Technology Pravin Patil Polytechnic"Senior Lecturer, OME in electronics and communication) Information Technology
[2]. Smart Drainage System Using IOT : Kamal Sahoo, Janhvi Tambe, Shravani Patil, Abhishek Mathpati, Mrs. Prachi Kalpand Student, hdormation Technology Pravin Patil Polytechnic Senior Lecturer, OME in electronics and communication) lnformation Technology, Pravin Patil Polytechnic
[3]. Muagesh SK, Santhosha Ran, "Internet of Things Automatic Monitoring System for Underground Sewers and Wells in Metropolis. Inernational Journal of Information and Computing Technology. ISSN 0974-2239, 4, mumero 12 (2014), 1211-1220
[4]. Lillian.A and William H (2012). Solid waste challenges for cities in developing countries, Journal of waste management.
[5]. Aliyu b,Nabegu (2008). The role of refuse Management and Sanitation boars in solid waste management in Kano Metropolis. 3. Sehyun and Williams B (2010). Food waste management by WHO , Geneva.
[6]. Urban solid waste collection system using Geographic Information systems , Claudia Andrea Arribas (2007).
[7]. Tushar Pathak 1. Sanyogita Destumukh2, Pooja Reddy), prof H. P. Rewatkar4, Sman Drunage
[8]. 8 An IoT-Based Complete Smart Drainage System for a Smart CityTarannum Zakı, Ismat Tarik Jahan, Md Shohrab Hossain, Husnu S. Narman Department of CSII, Military Institute of Science and Technology, Dhaka, Bangladesh Department of Computer Science and Engineering, Bangladesh University of Engineering and Technology, Bangladesh.