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D-Trash

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ABSTRACT: In the backdrop of prompt advancement, information, and communication technology (D-trash) has become an inevitable part to plan and design of modern solid waste management (SWM) systems. This study presents a critical review of the existing trash management and their usage in SWM systems to unfold the issues and challenges towards using integrated technologies-based system. The modern economy's growing volume and complexity of trash pose a severe threat to ecosystems and public health. D-trash is an IOT-based device used to efficiently manage data collection and resourcing from trash. An existing problem in society is the data extraction from the Recycle Bin which is almost non-existent and underutilized which helps in efficient use of Trash collection and management. The first step of the project is to do data collection from the Trash (Volume, time strap, Location and type of contents inside such as a solid or a liquid). The second step is the resourcing of data based on the collected data that are retrieved from available resources using the ML algorithm (Random forest, Dijkstra algorithm) to find the shortest distance for efficient trash collection. The use of CNN and LSTM helps in depicting values for a main variable of interest across two axis variables as a grid of colored squares tracing up a heat map.

I. INTRODUCTION

The Internet of Things is a new paradigm that was made possible by recent advancements in its underlying technologies, including smart sensors and communication technologies, which allow for the connection of machines, devices, software, and objects and their autonomous communication without the need for human interactionist is a dynamic and worldwide network architecture in which intelligent things, subsystems, and individual physical and virtual entities are recognizable, autonomous, and self-configurable.

The research effort suggests a Smart bin system that determines the fullness of litter bins with the goal of enhancing the job of cleaning operators to manage cleanliness concerns in real time and to raise their productivity. Data is gathered and sent across a wireless mesh network using the suggested system. In order to save energy and extend operational life, Smartbin also employs a duty cycle approach. This approach was evaluated in an outdoor setting to validate the experiment, which demonstrates that bin suppliers may regulate their use of litter bins and the cleaning staff may optimize their labor.

D-trash is a IOT based application device cum application integrated platform which is fixed on a lid on a dust bin. components and functionality are:

- It includes a low powered device with ultrasonic and infrared ranging sensors.
- USB cable attached on the top of the lib for reverse charging and data transfer.
- The IOT device is backed with solar power in case of emergency.
- Once the trash container is filled more than 85% an automated message is sent to system authorities to clear the container.
- All D-trash authorities are synchronized with each other to enhance their throughput efficiency.
- The platform allows the user to upload images of trash overflow in the application in order to notify the authorities.

The platform allows users to upload images of trash overflow in the application, in order to notify authorities. D-TRASH leverages the data of your current waste management operation and transforms the manually scheduled routes into fully optimized routes using ML algorithms.

So for India there are no such technologies that input the use of iot in the sector of trash management system, this had caused a huge outlay where the foreign countries had started to recycle the trash in a well structured manner. It is expected that the implementation of this technology would result in proper monitoring of trash bins with effective use of the resources.

II. RELATED WORK

Research has demonstrated that the utilization of Information and Communication Technologies (ICTs) can greatly enhance the efficiency of Solid Waste Management (SWM) by reducing costs, time, risks, and environmental impacts (Lu et al., 2013). Previously, SWM was manually conducted, resulting in unplanned waste management, site selection for trash bins, collection points, disposal points, and recycling stations without proper planning. Waste collection was also conducted without analyzing demand, and drivers constructed their routes for waste collection, leading to inefficient collection as trash bins may be empty or overflow. This often results in costly re-collection efforts and poses environmental threats (The World Bank, 2012). With the increasing urbanization, the importance of an efficient SWM system is ever-growing. Although various systems have been proposed to address these issues, it is difficult to determine the best combination of technologies to achieve an efficient SWM system.

The systems widely used for SWM can be categorized into three groups. The first group comprises spatial technologies-based systems that use Graphical Information System (GIS) and/or Global Positioning System (GPS) or Remote Sensing (RS) as their main technology. SWM operators use these systems to monitor the location of trash bins and collection vehicles during collection (Wilson et al., 2007; Yang et al., 2008; Zamorano et al., 2009). The second group comprises identification technologies-based systems that use Barcode or Radio Frequency Identification (RFID) tags installed with trash bins for tracking identification to determine their location and to acquire the time of collection (Chowdhury and Chowdhury, 2007; Friedlos, 2005; Greengard, 2010; Kietzmann, 2008). The third group comprises data acquisition technologies-based systems that include several sensory elements installed inside trash bins, such as image sensors, distance sensors, volumetric sensors, etc., to observe their status (Rovetta et al., 2009; Johansson, 2006). Additionally, data communication technologies are typically used in all three types of systems to facilitate the transmission of captured or analyzed data.

III. METHODOLOGY

The development of the D-Trash monitor includes the identification of the most suitable sensor that includes Different types of sensors that can be used to monitor the level and composition of trash. For example, ultrasonic sensors can be used to measure the level of solid waste, while load cells can be used to measure the weight of the trash bin to determine the amount of waste. For liquid waste, flow meters can be used to determine the volume of liquid waste in the bin. Based on the specific needs of the monitoring system, appropriate sensors should be chosen. The second step includes the determination of the placement of these sensors. The sensors need to be strategically placed within the trash bin to ensure accurate readings. The placement of the sensors should be such that they do not get damaged by the waste. Additionally, the sensors should be placed in a way that the readings are not affected by the movement of the waste in the bin which gives the best spot on placing the sensor on top of the trash for a better view of angle, accurate monitoring and for its safety. Now to install the sensors and connect them to a microcontroller: Once the sensors have been chosen and their placement has been determined, they should be installed within the trash bin. The sensors should be connected to a microcontroller that can process the data and send it to a central monitoring system. This is all the necessary method for the development of the trash monitor for the purpose of Data collection.

The use of ML helps in efficient resourcing of the data that has been retrieved from the trash bins. By analyzing the data collected by the sensors, a machine learning model can be trained to determine the composition of the trash. This can be achieved by using image recognition algorithms to identify solid waste or by analyzing the chemical properties of liquid waste. The next most important step is the integration of the with a central monitoring system. The trash monitoring system should be integrated with a central monitoring system that can track the level and composition of the trash in real-time with the help of an AD-hoc network. This would enable the waste management team to plan the collection and disposal of waste efficiently. The final part of developing the prototype includes the testing of the system by deploying the trash monitoring system on a large scale, it should be tested extensively to ensure that it functions properly and delivers accurate readings. The system should be tested under different conditions to identify and resolve any issues.

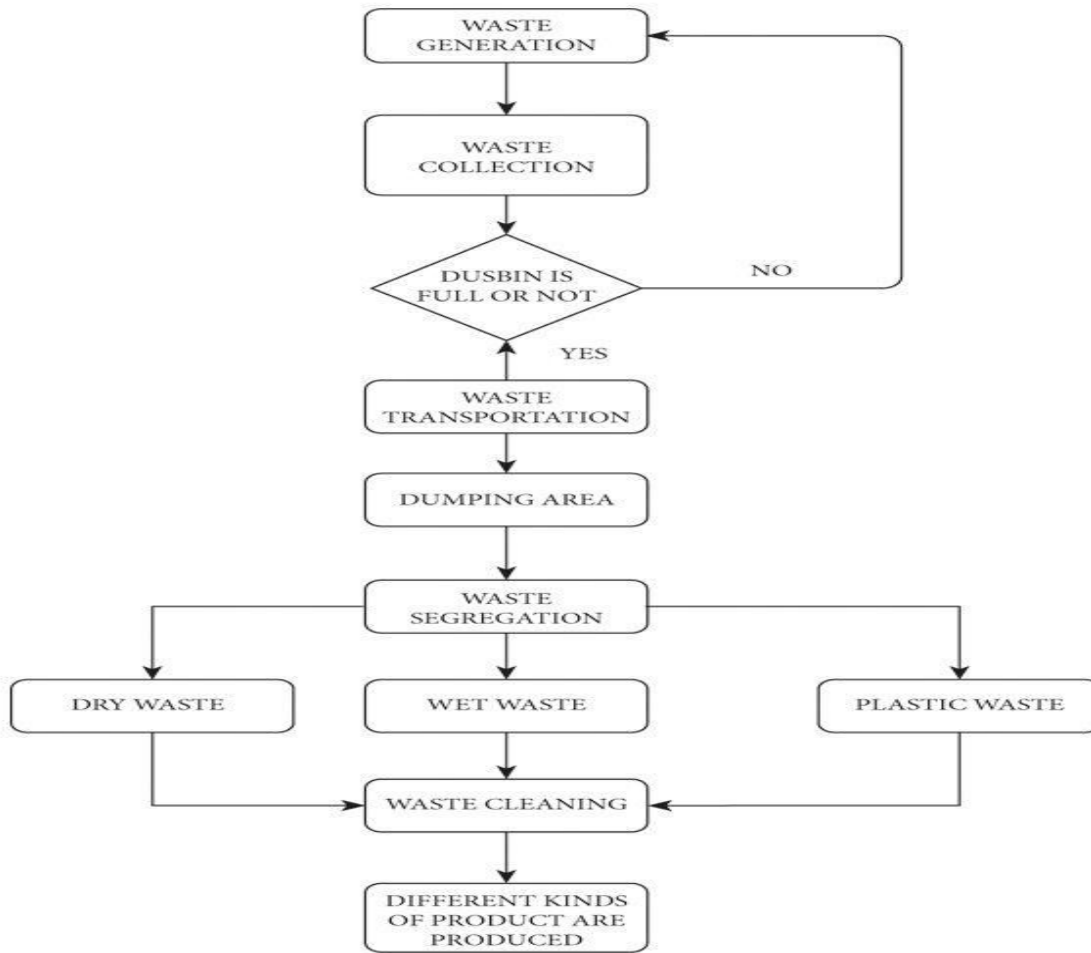
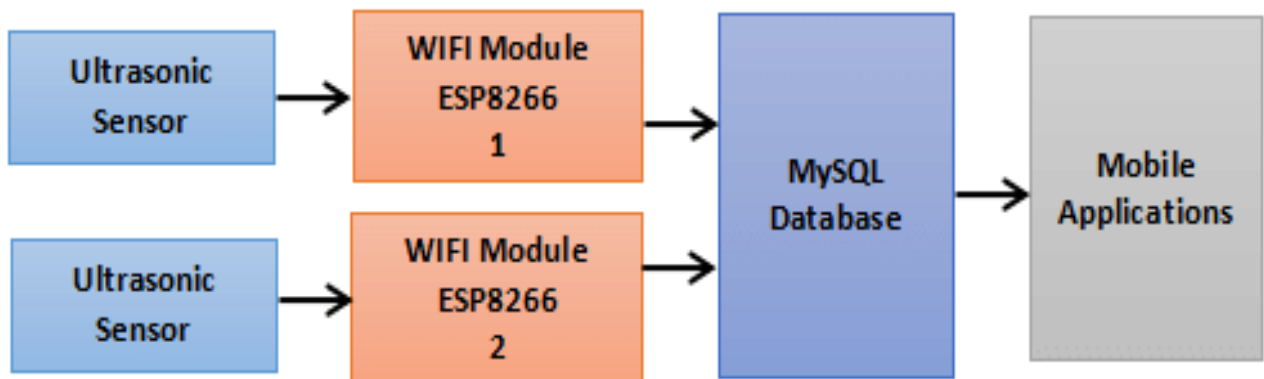


Figure 1.1—Structure of Methodology

V. PROCESS FLOW DIAGRAM



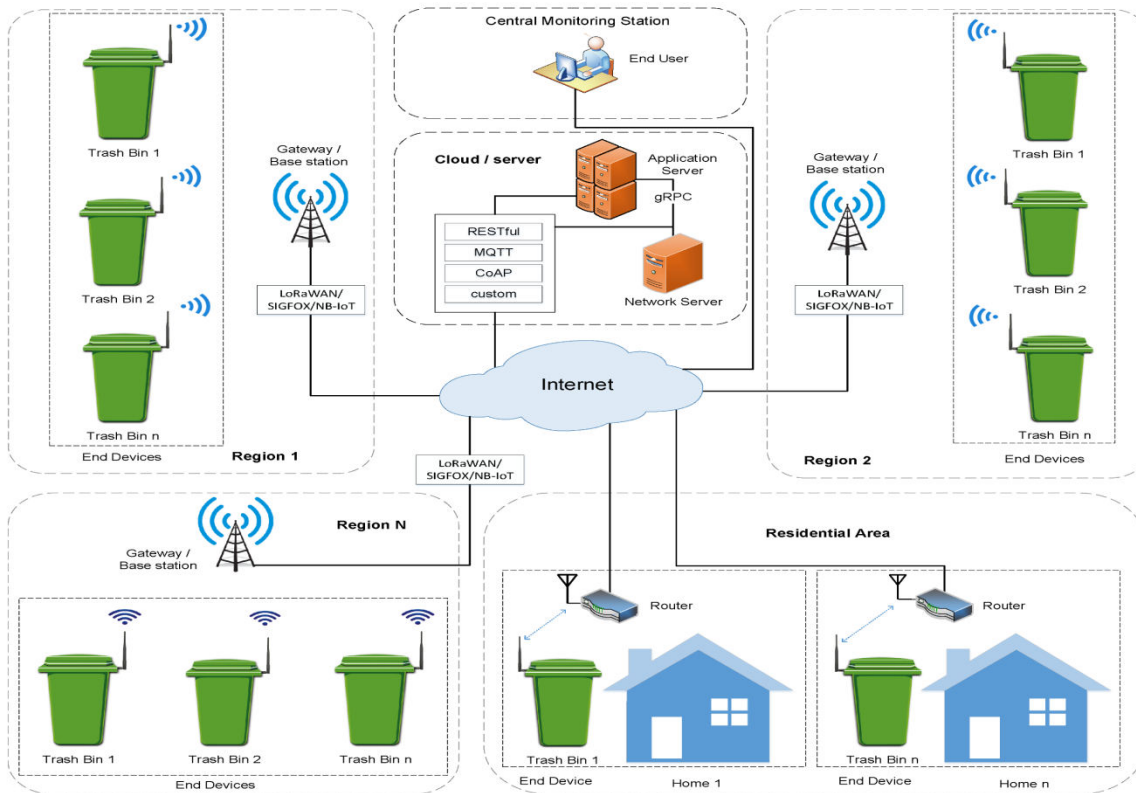


Figure 1.3— System Architecture of the workflow

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