

Smart Waste Bin using IoT

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Abstract— In the present day scenario, many times we see that the garbage bins or Dust bin are placed at public places in the cities are overflowing due to increase in the waste every day. It creates unhygienic condition for the people and creates bad smell around the surroundings this leads in spreading some deadly diseases & human illness, to avoid such a situation we are planning to design “IoT Based Waste Management for Smart Cities”. The system is designed based on three main elements; Master station, Slave station, and Internet of things (IoT) platform. The master pin station gathers the data from the slave stations and transmits it to the IoT application for remote management and monitoring purposes. The system is powered up by using solar panels. Four parameters are used for monitoring and managing the waste: temperature value, level in percentage reading, smoke detection, and the global positioning system (GPS) location. This paper proposes a smart waste management system, by using the IoT (Internet of Things) technology.

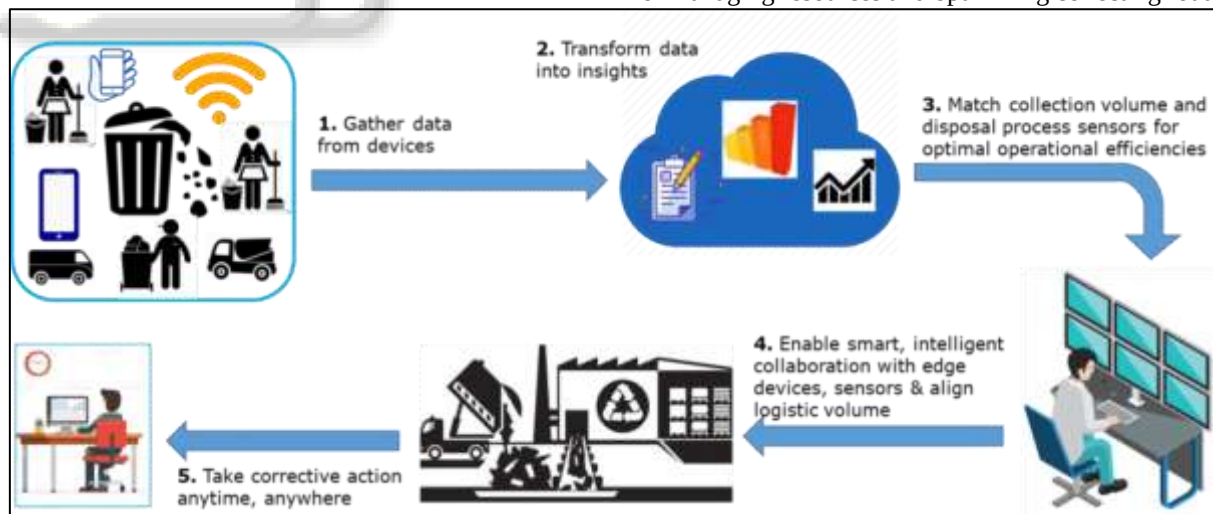
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I. INTRODUCTION

A smart city is an urban area that uses different types of electronic data collection sensors to supply information which is used to manage assets and resources efficiently.

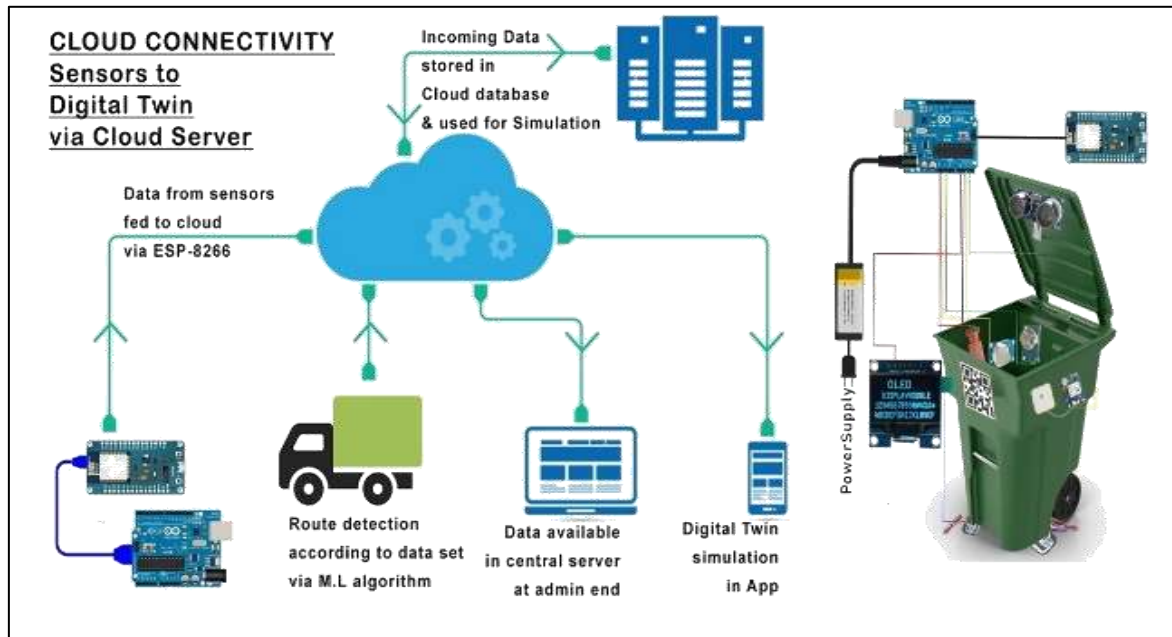


This includes data collected from citizens, devices, and assets that is processed and analyzed to monitor and manage traffic and transportation systems, power plants, water supply networks, waste management, law enforcement, information systems, schools, libraries, hospitals, and other community services. Smart city technology allows city officials to interact directly with both community and city infrastructure and to monitor what is happening in the city and how the city is evolving. Major technological, economic and environmental changes have generated interest in smart cities, including climate change, economic restrict ring, the move to online retail and entertainment, ageing population, urban population growth and pressures on public finances., especially, from the point of managing resources and optimizing collecting routes.



There are multiple dustbins are located throughout the city or the Campus (Educational Institutions, Companies, Hospitals, etc.). These dustbins are interfaced with micro controller based system with IR Sensors and RF modules. Where the IR sensor detects the level of the dust in dustbin and sends the signals to micro controller the same signal are encoded and send through RF Transmitter and it

is received and decoded by RF receiver at the Central System (Intel Galileo) and an Internet connection is enabled through a LAN cable from the modem. The data has been received, analyzed and processed in the cloud, which displays the status of the Garbage in the dustbin on the GUI on the web browser.



II. SYSTEM ARCHITECTURE:

Figure 1 illustrates the system architecture. The IoT device is embedded in the waste containers/bins. The IoT device consists of a MCU (Micro Control Unit), a color LED, a gas sensor, a 3-axis compass, an infrared sensor and a ultrasonic sensor. The sensing data are transmitted to the servers through 802.11 wireless LAN in the indoor environment and LoRa (Long Range) in the outdoor environment. Figure 1. System Architecture The IoT device is an MQTT publisher when 802.11 is used, and the LoRa gateway is the MQTT publisher when LoRa is used as the Radio Access Network (RAN). The sensing data is delivered to the MQTT server and then forwarded to the Data Agent (an MQTT subscriber). The Data Agent then stores the data into the MySQL database. The Alert function periodically checks the status (waste and smell levels) and notifies the manager when the waste level exceeds the threshold. The notification function wakes up the smart phone by making a call and the smart phone identifies the notification by the caller ID. Through this way, the user device can save battery power.

III. PROPOSED SYSTEM

The proposed system is equipped with 3 main segments; Master station, Slave station, and IoT platform. The master station gathers data from the slave stations and transmits it to the IoT application for remote management and

All the measured data is sent to an IoT platform where decision support user can visualize, analyze and extract, with the ability to collect measures in data analysis tool supported by the platform. Finally, the system is powered by solar panels. The master waste bin is the main station where all readings from other stations (i.e slaves) arrived via NodeMCU module. In this stage, mainly four nodes are attached which are reading the measures of its

own sensors, receiving other stations' measures, setting up the mobile data link, and activating the IoT receiving packages (Process 1, 3 and E1). Process 2, presents the initialization of power reading and solar system set up together with advertisement

IV. PROBLEM DEFINITION

Our community following problems due to improper waste collection system: – Uncollected wastes often end up in drains, causing blockages that result in flooding and unsanitary conditions. – Open waste bins also attract stray and domestic cattle. – Flies and mosquitoes breed in some constituent of solid waste, and they are very effective vectors that spread disease. – The open burning of waste causes air pollution. – Uncollected waste degrades the urban environment discouraging efforts to keep streets and open spaces in a clean and hygienic condition.

A. Disadvantages of the Existing System

- Time consuming and less effective: trucks go and empty containers whether they are full or not.
- High costs.
- Unhygienic Environment and look of the city.
- Bad smell spreads and may cause illness to human beings.
- More traffic and Noise.

B. Advantages of the Proposed System

- Real time information on the fill level of the dustbin.
- Deployment of dustbin based on the actual needs.
- Cost Reduction and resource optimization.
- Improves Environment quality
 - Fewer smells
 - Cleaner cities

V. WORKING PRINCIPLE

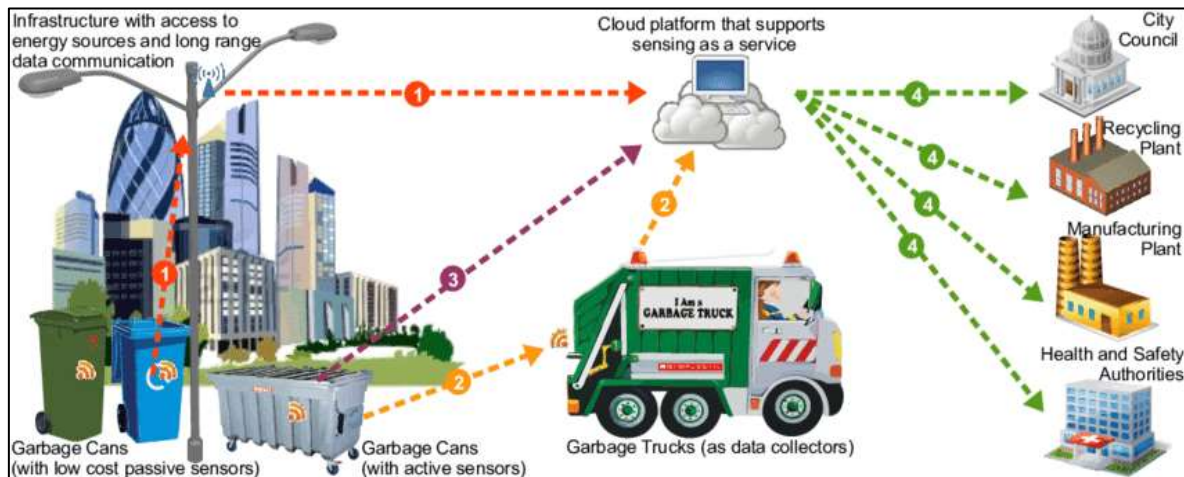


Fig. 6.1: Block Diagram of the proposed System

The Block diagram shows the different component used in the Smart Dust bin System. IR Sensor, 8051 microcontroller, Power Supply, RF Transmitter, RF Receiver, Intel Galileo microcontroller and the web browser. The project module is divided into two parts Transmitter section and receiver section. Here in the transmitter section we are using 8051 microcontroller, RF Transmitter and sensors these are attached to the dustbin. Where sensor are used to detect the level in the dustbin whether the dustbin is full or empty. The sensor senses the content of the dustbin and sends the signals or the data to the 8051 microcontroller, Power Supply +9V Battery power supply is given to the 8051 microcontroller to drive the system and the 8051 microcontroller reads the data from the sensor and process the data received from sensor, and the same data wirelessly transmitted to the Central system (Intel Galileo microcontroller) using RF Transmitted. RF Transmitter is to transmit the signal form 8051 microcontroller to the asection is receiver section in which RF Receiver, Intel Galileo, and Web Browser is used. Here RF Receiver is used to receive the data sent by RF transmitter to the Intel Galileo microcontroller. The Intel Galileo Gen2 Microcontroller is used to receive the data sent by the multiple transmitters and process the data and the same data transmitted to the Client i.e., Web Browser.

VI. RESULT

This project Smart Waste Management using IOT is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a mobile application. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of Raspberry Pi for sending data. The system is powered by a 12V power supply. An application is built to show the status to the user monitoring it. The application gives a view of garbage bins and highlights the garbage collected in colour in order to show the level of garbage collected. Thus, this system helps to keep the city clean by informing about the garbage levels of the bins by providing image of the bins via IOT application development platform. The authorized

person receives the indication of garbage dustbin is full through the application and then inform the concerned person who is responsible for the collection of garbage where the garbage bin is full in particular areas. The data get stored in the database created and then the data is retrieved in IoT applied to external and public environments, communication is important for service provisioning. In particular, since this type of IoT has a wide service domain reliable communication is necessary for devices to communicate with each other. Therefore, the SGBs utilized in the proposed system communicate with each other based on a wireless mesh network, securing communication reliability. IoT devices in an external environment may need to move on occasion. With a battery based power supply, the mobility of the proposed system is secured. In IoT with a wide service domain, data exchanges and services should be conducted seamlessly at any time and any location User convenience has been enhanced with the advent of IoT. The real-time data transmission and access

A. Avoids the overflows of Dustbins

This IoT based waste management is very useful for smart cities in different aspects. We have seen that, in cities there are different dustbins located in the different area's and dustbins get over flown many times and the concerned people do not get information about this. Our system is designed to solve this issue and will provide complete details of the dustbin located in the different area's throughout the city. The concerned authority can access the information from anywhere and anytime to get the details. Accordingly they can take the decision on this immediately.

VII. CONCLUSION AND FUTURE WORK

It will stop overflowing of dustbins along roadsides and localities as smart-bins are managed at real time. The filling and cleaning time of smart bin will also be reduced thus making empty and clean dustbins available to common people. It also aims at creating a clean as well as green environment. Send optimized routes directly to drivers. It will reduce fuel Consumption.

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