Smart Waste Management System in Metropolitan Cities

Introduction :

The solid waste is increasing in urban and rural areas as the population is increasing and waste management has become a global concern. In order to manage this overflowing garbage we need to take right decision. Mainly there are three types of sources where garbage is generated viz. residential, commercial and industrial. The garbage produced in the residential area can be collected directly from home or by making an arrangement for mass collection in that area and can be lifted using vehicles. In case of restaurants, malls and other commercial establishment garbage can be collected directly from the unit using vehicles. Industrial garbage which includes waste produced in construction sites, various industries can also be disposed using different ways. For effective handling of these wastes like collection and disposal, Internet of Things (IOT) concept is being used, which mainly deals with sensing, actuating, data gathering, storing and processing by connecting physical and virtual devices to the Internet.

Literature Survey:

[1] provides the idea of sensors-based waste bins, capable of notifying waste level status. An automatic waste bin and make use of cloud computing paradigm to evolve a more robust and effective smart waste management mechanism. Cloud SWAM, in which each bin is equipped with sensors to notify its waste level. Different bins for each category of waste, namely: organic, plastic/paper/bottle, and metal. Timely and efficient way of collecting waste leads to better health, hygiene, and disposal. The system provides shortest path to the location of waste bins. So the collectors can plan a better and fuel efficient route. Recycling and disposal by the system s uses separate smart bins for each type of waste.

Advantages:

- Timely waste collection, Route optimization Recycling and disposal, Resource management, Food industry planning Taxation, Big Data analytics Healthcare ,Waste-based energy production

Disadvantages:

- System requires number of waste bins for separate waste collection.

[2] mainly consists of a smart waste (RFID) tag, a Reader and a waste management IT system. A RFID reader on each waste collector vehicle will ensure that the weight and identity of the waste is passed to the PDA and automatically logged into an integrated database server. The RFID reader can also request any additional information from the waste tag that is encoded on it. . When robotic/lifting arms in the waste collector loaded onto the vehicle then the weighting measures the weight of each bin. The bin ID is then used to calculate actual waste disposal charges for each individual household.

Advantages:

- Waste disposal charge can be calculate, can Track missing/stolen bins quickly and accurately without human intervention, automate customer invoices, enhance cost savings , Improve security.

Disadvantages:

- Metal objects or liquid containers difficult to tag and track with a RFID system.
- The RFID tag is also affected by objects surrounding it especially metallic objects.

[3] proposed Smart bin system has 3 –tier architecture.The ultra sound sensor installed in every Smartbin senses bin fullness and report readings and sensor statuses. The sensor reading is transmitted to the gateway nod which is installed in every sensor cluster. It forwards the information to the backend server. analytics module in the back end server analyzes data collected by the bin sub system. The analytics module processes fullness readings, compares against predefined rules, and generates event upon exceeding threshold. The bin sub-system sends information to the workstation and it shows meaningful information to users through a graphical user interface.

Advantages:

- Obtain litter bin utilization - utilization information shows how a bin has been utilized litter bin daily seasonality information.- shows the time when a bin is usually full.

Disadvantages:

- The sensor node was deployed with battery power. Low power consumption sensor node must be used because of its limited power.
- The sensor node had limited memory size.

References:

[1] Mohammad Aazam, Marc St-Hilaire, Chung-Horng Lung, Ioannis Lambadaris , (2016),"Cloud-based Smart Waste Management for Smart Cities",IEEE.

[2] Belal Chowdhury, Morshed U. Chowdhury, (2007) "RFID-based Real-timeSmart Waste Management System", Australasian Telecommunication Networks and Applications Conference, December, Christchurch, New Zealand,IEEE.

[3] F achmin F olianto, Y ong Sheng Low, Wai Leong Yeow , (2015) "Smartbin: Smart Waste Management System", Tenth International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP) Singapore, 7-9 April, IEEE.