iWaste Management

Submitted By,

Amshaja D R (12406007)
Divya R(12406017)
Geethu G Shenoy(12406020)

ABSTRACT

The present system of collecting waste has been done using static routes and wastes are collected every day and are dumped locally, by whatever means locally available. The absence of efficient waste management has caused serious environmental problems. Therefore, in this paper, an IoT-based waste management is proposed to improve the waste disposal and an innovative modeling framework to support planning, management and optimization of waste collection operations.

CONTENTS

1. INTRODUCTION

Overwhelmed waste generated is a consequent side effect of growing consumption and production. Concurrently with more demands of goods and services to serve human needs, the more amount of waste is disposed of to the environment. This tends to increase with the economic development and rapid urbanization of the society. The increasing generation of waste and its disposal is a serious problem in Kerala with depleting landfill spaces and limited capacities. This increasing waste generated amount together with more awareness on human health, environmental impacts and social problems, have yearned for strategies and techniques to reduce the amount of waste generated. Proper disposal of all waste is vital to mitigate health risks [1]. Waste management, a basic public service, should be effectively provided to public that will eventually make the system run itself productively and ultimately contribute to better quality of life and environmental safe guards.

Today's waste management system has been mapped into different waste management strategic policies. Still, there is a very high demand for an improved level of waste management service. Thus, Waste Management using IoT is an urgent need of effective waste management strategies. The effective iWM (iWaste Management) strategies can be applied to manage all types of waste, not only in the national level (where guidelines, targets, and strategic action plans are set), but also at the local level (where waste management actually takes place). Difficulties in providing proper waste management service corresponding to the demands are typically due to the institutional, technical and financial constraints at national and local government levels, as well as in the private sector.

Present system of waste management is a costly urban service that consumes around 20% - 50% of municipality's annual budget. Furthermore, 85% of solid waste management funds are spent on waste collection and transportation [2]. It becomes an excessive wastage of resources when bins are collected that are filled up partially. In waste collection and carrying activities, the operational cost can be reduced by optimizing the quantity and deployment of collection bins and their collection rate. Estimating the status of quantity in waste level inside the containers help to optimize collection routes and improve collection efficiency [3].

In this paper, we propose the use of smart wireless sensors to gather fill-level data from waste containers which is fixed inside it. It also detects the rate of decomposition process which avoids stinking. The service then automatically generates schedules and optimized routes which take into account an extensive set of parameters. New schedules and routes are planned not only looking at the current situation, but also considering the future outlook as well. All real-time measurements and forecasts can be accessed through a web application.

2. EXISTING SYSTEM

As per Supreme Court of India had directive, all the local governments in India above a population strength of over ten lakh need to set up proper facilities for processing waste generated within their limits. And Supreme Court wanted waste management facilities to be in place in such municipalities by December 31, 2003.But a majority of the municipalities in India could not successfully implement this Supreme Court directive, even as on mid – 2010 [4] .

Whereas Kerala is one of the few States in the Country that took some measures to address this issue by launching an initiative called Clean Kerala Mission. The mission was launched in 2002. Objective of the mission was to create a garbage free Kerala.

The existing system is that the Waste form residents are collected by Kudumbasree units and disposed, by whatever means locally available. As the result ,the state today is a big heap of garbage owing to total collapse of waste management systems which has failed to keep pace with the unprecedented urbanization. Therefore, there is an urgent necessity of improved planning and implementation of comprehensive management systems for upgrading the environmental scenario of the State [5].

Hence the concept of IoT is incorporated into this waste management scenario which makes it efficient and low cost.

3. PROPOSED SYSTEM

The iWM will be done by three steps:

1. Monitoring
2. Analysis
3. Scheduling

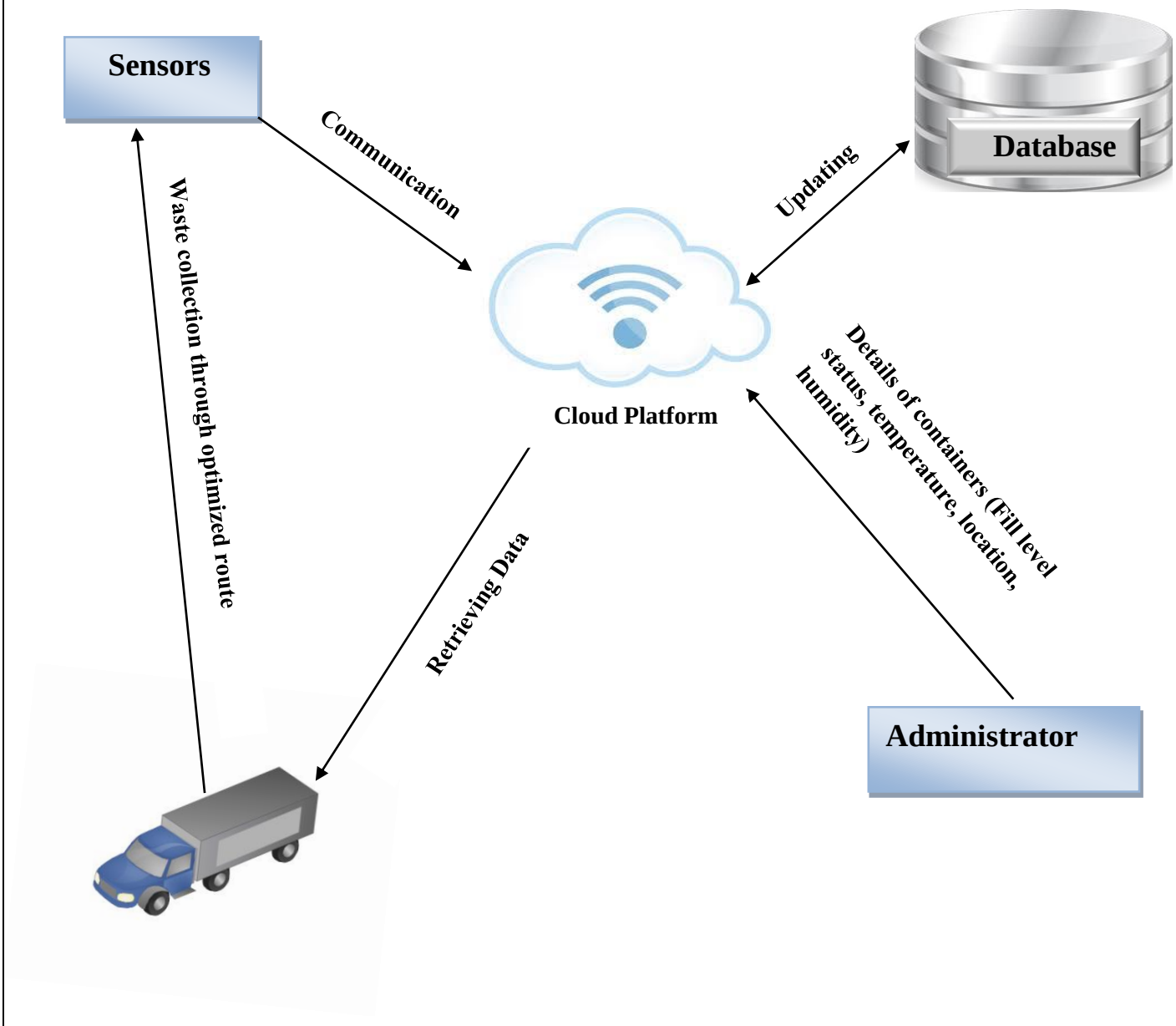
A wireless sensor will be attached to each container. These sensors will firmly attached and hidden away out of sight inside the container. They frequently measure and forecast the container's fill level, humidity, temperature and decomposition rate [6] of the containers in real time. These data are stored in the cloud and update the database. The monitored information is provided through a web based service, which the administrator can access. The administrator analyses the datasheet of all containers and then make the list of containers that are to be emptied. Their locations are given to the truck. The truck travels through the optimized route and collects the waste. Then, the waste is dump at the transfer station for recycling and renewing.

Advantages:

The proposed system is advantageous in the many ways.

- It lowers the expenses by reducing the trucks needed for collection, fuel used for trucks and also the labour cost.
- It also provides a better hygienic environment by reducing the emission of harmful pollutants from burning and provides litter free surroundings.

4. SYSTEM ARCHIECTURE



5. SYSTEM DESIGN

- Software requirement specification

The minimum requirement of the working system is as follows:

Front End : PHP

Back End : MySQL

Operating System: UBUNTU

- Hardware requirement specification

The minimum requirement of the working system is as follows:

- Arduino UNO (R3)
- Sensors:

  -Ultrasonic Sensor HC-SR04

  -DHT11 (Temperature and humidity sensor)

  -Tilt sensor

  -MQ4 (Gas sensor)

- Raspberry pi 2

6. MODULE DESCRIPTION

The project has Admin module. This module has its own features.

Features of Admin module:-

1. Login: For application use.

2. Container management: To manage the containers.

3. View Location of container: Can view the particular container's location.

4. View filled containers: Can view the filled containers.

5. View Statistics: Can view the statistics of the day.

6. View availability of truck: According to the availability of the truck can assign route for the waste collection.

7. Log sheet: Using the log sheet of the month can be preplanned efficiently for the coming months.

7. CONCLUSION

In this paper, we proposed an IoT-based iWaste Management (iWM) system for replacing the current existing system. The practical application of the proposed methodology will lead to the identification of the overfull containers, the best scheduling plan and the most suitable optimal routes which substantially improve the cost effectiveness of the collection cycle. It also results in a hygienic environment.

As with any environmental concern, research is key to solve the problem. It is suffice to say that technologies are very important and have significant impact on waste management effectiveness. The proposed system is focused on waste management in Kerala. A furthermore study on regional optimization of Municipal Waste management is to be undertaken, which take into consideration the collection routing problem and the frequency of collection, which can be considered as future work of this paper to complete this study of all the municipal solid waste supply chain system. With more objectives, the model can be managed with different multi-objective solution techniques.

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