Geolocation Based Advance Waste Collection

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Abstract- ***Everyday a huge amount of solid waste generates. It generates from various sources such as from industries, markets, house complexes, etc. This waste also varies in state and shape. As the human involvement is rising in nature, we have seen a rapid growth in solid waste in the world. Due to rise in solid waste, various problems have arisen in society. To reduce those problems and build a well-defined solid waste management, we have developed a "GEO-LOCATION BASED ADVANCE WASTE COLLECTION" system. This system focuses on optimization of entire solid waste management process. For a specific region or city, garbage bins are set to different locations in that city or respective region. An ultra-sonic sensor is attached to every garbage bin. As soon as the garbage gets overflow from bin, this sensor sends a signal to a Wi-Fi module which then send data to web application. Current status of garbage bin is monitored by management personnel. Selection of proper vehicle to collect waste from a site and to dump it on a dumping site is one of the task of the management personnel. The respective vehicle would lift the garbage and dump it on a dumping site through an optimized way. Management personnel can analyze vehicle trip reports for further evaluation. An application has developed for citizens to initiate a complaint regarding waste. They can further track the status of their complaints. This system is economically beneficial to the authorities because of its high efficiency and optimization.***

Indexed Terms- ***Flutter, Geo-location, Real time analysis, Solid waste management, Ultrasonic sensor, Wi-Fi module.***

I. INTRODUCTION

Solid-waste management, the collecting, treating, and disposing of solid material that is dis-carded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease that is, diseases spread by rodents and insects. The tasks of solid-waste management present complex technical challenges. They also pose a wide variety of administrative, economic, and social problems that must be managed and solved. To reduce those problems and build a well-defined solid waste management, we have developed a "GEO-LOCATION BASED ADVANCE WASTE COLLECTION" system.

This system focuses on optimization of entire solid waste management process. Waste collection sites is defined and mapped. In a timely manner, collection of waste can be done as soon as garbage gets full at waste collection site. Management personnel would select suitable vehicle for collection and transportation of garbage which would avoid unnecessary loops of vehicles.

As the solid waste being collected at waste collection site, the vehicle would dump the solid waste through an optimized way. Citizen's involvement is also a key parameter in achieving a sustainable waste management model. An android application have been developed that facilitates citizens to initiate a complaint, track their complaint. Through this involvement of citizens and authorities would create a sustainable solid waste management.

II. PURPOSE AND SCOPE

A. PURPOSE

Geo-Location Based Advance Waste Collection is a new way of managing solid waste of a region. This enables efficient and cost-effective method of waste collection. Due to the inheritance of geo-location of dust bins in a region, vehicle can easily monitor and collect solid waste. Solid waste management authorities can easily track the current status of dust bins due to sensors integrated to it. Citizens can initiate complaint through mobile application if they find any issue related to garbage around any public dustbin. This mobile application can also facilitate the service of tracking of complaints.

B. SCOPE

The scope of the proposed project is to maintain and monitor the solid waste of the town by the help of website dashboard and also help to track the waste level of the city. And also provide the activeness of waste management workers.

- This project helps to monitor the level of solid waste remotely and help to notify the worker for instance of waste level which provide greater accessibility to the dustbin.
- It provides location of dustbin to the user which are recorded in the database.
- It provides smart route for the garbage collector van which leads to reduction of fuel consuming and effective work.
- Provide work tracking platform for the workers.
- This project helps to maintain our city clean and minimize the pollution.

III. PROPOSED METHODOLOGY

A. PRODUCT PERSPECTIVE

Geo-Location Based Advance Waste Collection will automate some of basic functionality of the solid waste management. The aim is to provide a web application to waste management authorities for monitoring whole waste management process. Citizens will also be provided with a mobile application to raise a complaint regarding solid waste. Waste management authorities be able to monitor location of every dust bins located in their respective region. As the garbage gets full in a dust bin, it will be collected by waste collection vehicle. Garbage could not get scattered because of its on-time collection.

B. COMPONENTS OF SYSTEM

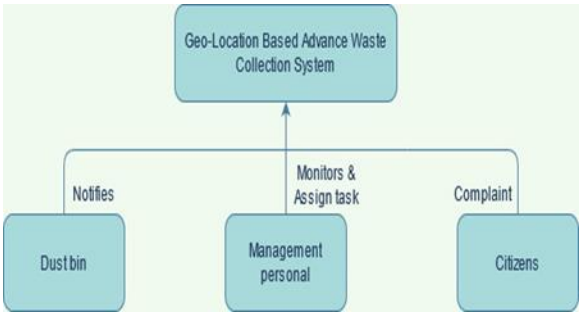

Fig.1. Major Components of system

C. PRODUCT FEATURE

Geo-Location Based Advance Waste Collection has many features like current status of solid waste in a dustbin can be obtained. Real time monitoring of dustbins across a region can be easily viewed in a web application. Waste collection vehicle will be notified directly by the solid waste management authority through a mobile application to collect solid waste from specific dust bin. Citizens can initiate complaint if any discrepancy occurs around the dust bin. A mobile application is provided to the citizens to easily interact with solid waste management authority.

IV. SYSTEM ARCHITECTURE

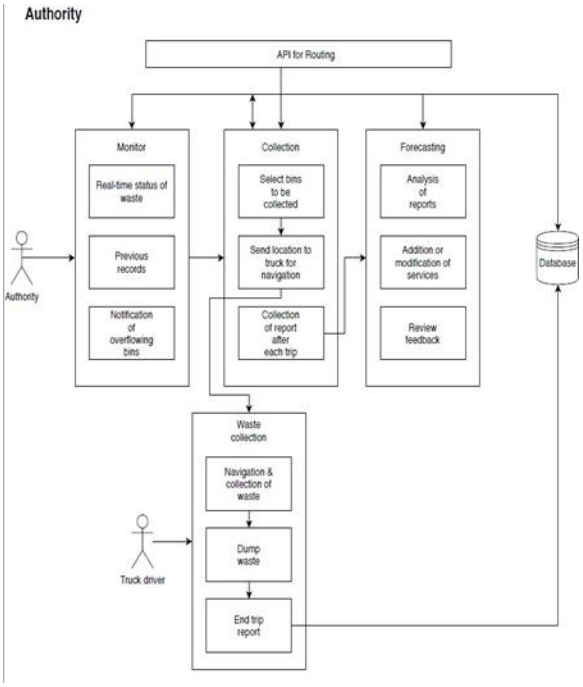

Fig.2. Authority

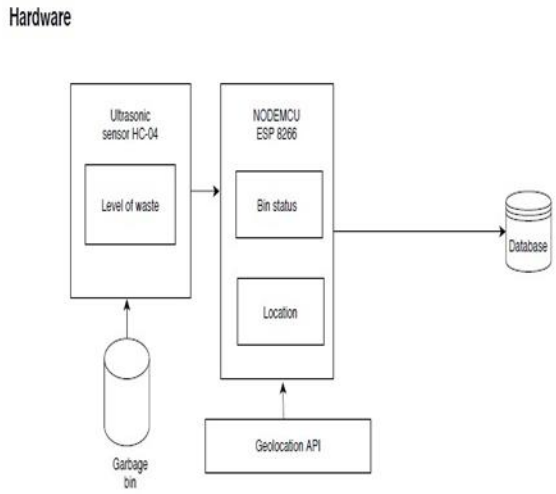

Fig.3. Hardware

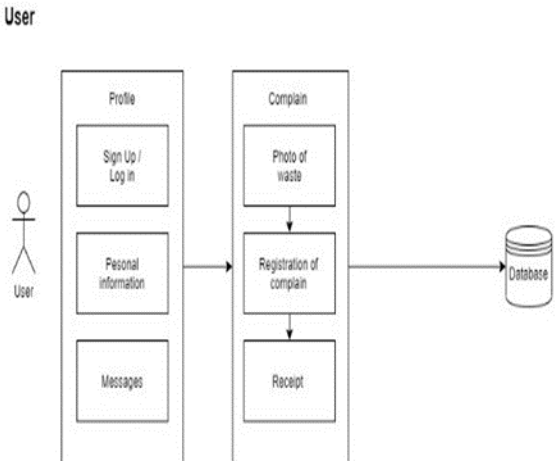

Fig.4. Citizen

A. HC-SR04 ULTRASONIC SENSOR

As shown above the HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed × Time

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below

B. NodeMCU ESP8266

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

V. RESULTS

The sensor used in the proposed methodology is HC-SR04 Ultrasonic (US) sensor. The Wi-Fi module used is NodeMCU ESP8266. The result of the methodology is shown below.

Fig.5. HC-SR04 Ultrasonic Sensor attached to dustbin

The HC-SR04 Ultrasonic Sensor is attached to upper side of the dustbin. This sensor senses the distance to solid waste. When solid waste reaches to full capacity of the dustbin, the sensor senses the solid waste distance and notifies to NODEMCU ESP 8266 Wi-Fi module that solid waste is reaching out the dustbin's capacity.

Fig.6. NODEMCU ESP 8266 Wi-Fi module attached to exterior side of dustbin

The NODEMCU ESP 8266 Wi-Fi module receives notification from HC-SR04 Ultrasonic Sensor and send this information to web application.

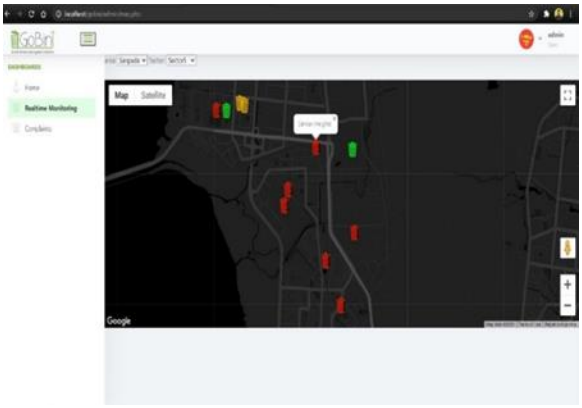

Fig.7. Real time dustbin status in web application

The web application allows to view real time status of dustbins that is whether they are empty, partially full or completely full.

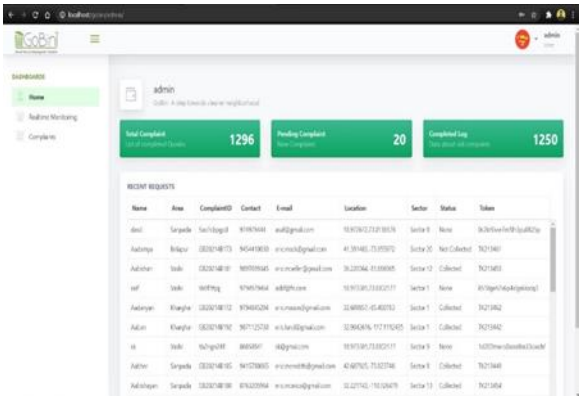

Fig.8. Administration Window

The administration window contains summary of registered complaints.

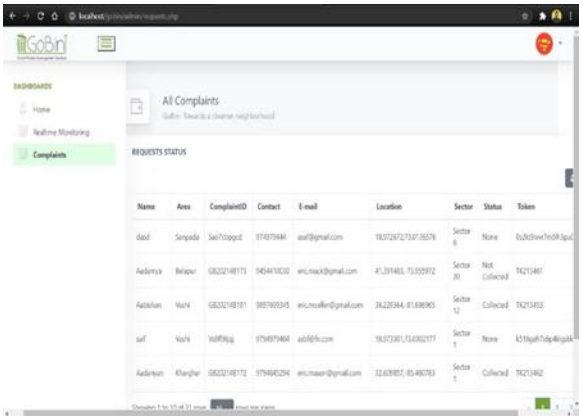

Fig.9. Complaints Window

The complaints window contains detailed information about complaints registered by citizens.

Fig.10. Mobile application home page

A mobile application is developed for citizens to register complaints regarding solid waste in their region.

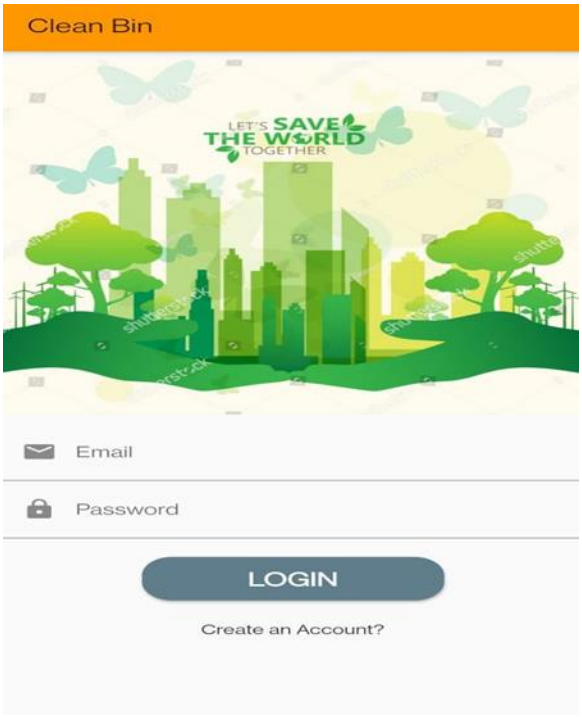

Fig.11. Login and Sign Up

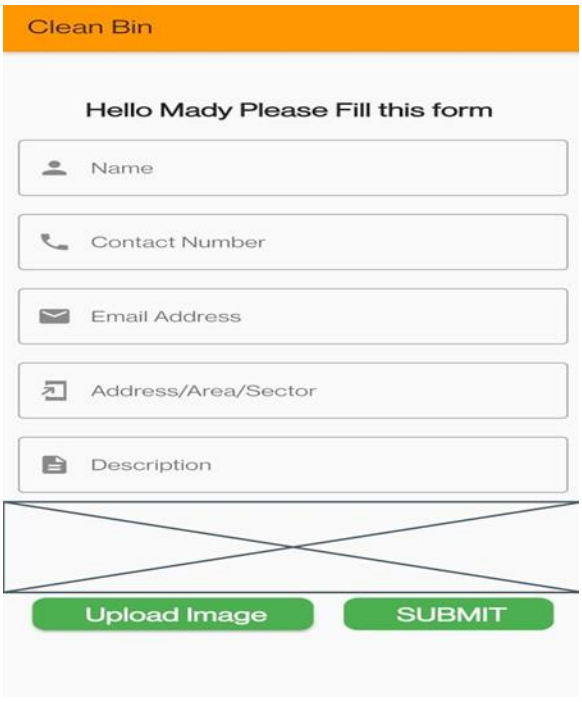

Fig.12. Complaint registration form

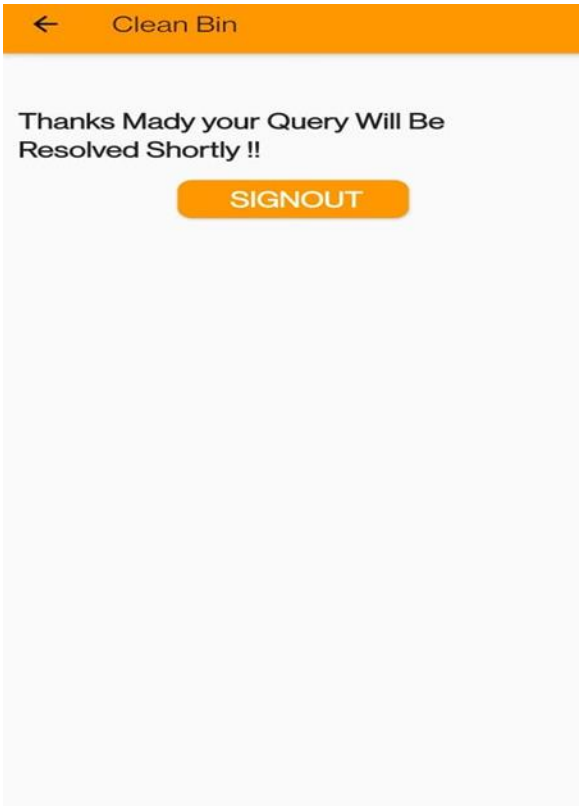

Fig.13. Confirmation of complaint

CONCLUSION

In the proposed methodology the real time status of solid waste can be obtained in the web application. Citizens can register their complaints through a mobile application. This proposed system is useful can be implemented easily. It is cost effective and less complex.

FUTURE WORK

For future work, this system can contain Routing Algorithm for optimal solution. GPS module can be implemented for path planning combined with ultrasonic sensors for traffic avoidance. Artificial Intelligence and Machine Learning could be implemented for predictions and future improvements.

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