IoT Based Waste Management System for Smart City

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Abstract: *In today's scenario there has been exponentially growth in solid waste generation. Increase in waste management is most serious issue in the whole world; also overflow of dustbins is common problem nowadays. These overflowing waste containers emit an offensive odor and create an unsanitary environment. To address these issues, in this article, we recommend and support the usage of the Garbage Control and Waste Management Framework for Smart Cities (IoT). The project's major goal is to develop a system that leverages sensor-derived data to manage waste collected. This proposed system includes an ultrasonic sensor interfaced with a node MCU controller fixed at top of dustbin to sense or detect the level of dust bins and transmit the status to management portal. The WIFI module is then used by the Smart City Waste Collection to relay this information to the central web portal. If the garbage collector reaches its threshold value, a notice is presented on the online portal, the responsible authority is notified, and all information from the Smart Bin Application is displayed on the user's mobile phone. This smart waste management system makes it possible to monitor the system. System also contains an android application for user through which he/she can able to find empty nearby dustbin. We often observe that dustbins are overflowing and also people throw garbage anywhere; hence android application has a feature through which user can send photos of this garbage to admin. This information photo and location of that area will be displayed on web porta, hence admin can take appropriate action. Hence, the most aim of this project is to scale back human resources and efforts at the side of the sweetening of a wise town vision.*

Keywords: Smart city, Smart waste management, Internet if Things (IoT), ultrasonic sensor, node MCU controller, android application, web application etc.

I. INTRODUCTION

Today, waste generated is a very deliberate problem for which enormous sums of money are spent on the collection and segregation procedure each year. Since the exponential increase in production or consumption, the quantity of waste generated by people has increased. In India, approximately 62 million tons of waste are generated each year. About 43 million tons, i.e., 70% are collected, and from which 10 to 12 million tons are treated remaining is dumped in landfill sites. Changing consumption patterns, it is estimated that urban municipal solid waste will increase. Municipal Solid Waste can be a major source of pollution in the environment. Proper maintenance is required for the efficient and effective removal of the generated Municipal Solid Waste. The biggest issue with garbage management is that the traditional system of garbage collection and these bins in public locations overflowed well before the next cleaning operation begins. In the current digital world situation, people have been armed with latest technologies and the internet to advance our work and boost productivity. In some nations, we have door-to-door recycling programs that require a lot of time and resources to collect trash. A waste collector must go to everyone's house, knock on the doors, and wait for each homeowner to bring the trash to them. Furthermore, people must be there to collect their trash at that certain hour, putting this plan at a severe disadvantage. There are other schemes in some nations where waste is collected from each colony's trash bins, although this system has the drawback of overfilling dustbins multiple times before waste is collected. This also allows for dustbins, a bacterial development area, animal feeding, and an insect breeding area. It is also common for dustbin collection to be done

ahead of time, resulting in fuel waste and possibly garbage collection charges. As a result, these systems require a lot of man power and fuel, and money is wasted unnecessarily at each phase of the process of these systems; Hence, the most aim of this project is to scale back human resources and efforts at the side of the sweetening of a wise town vision.

II. LITERATURE SURVEY

Ashiya Malak, Pallavi Bhoyar, "Garbage Collection System Using IOT- A Review", 2017.

In today's scenario, frequently we observe that the garbage bins or dustbins installed in public places are overflowing due to rapid increase in the waste and also increase in population. It creates unhygienic conditions for the people and creates bad smell around the surroundings, this leads in spreading some deadly diseases & human illness, hence to avoid such a situation this paper mainly focuses on implementation of "Smart Waste Management using IoT". In this System dustbins are installed throughout Campus; these dustbins are attached with cost-effective embedded device which helps in monitoring the level of the garbage in dustbins and anunique ID will be given for every dust bin; hence it will be very helpful to recognize which garbage bin is full. When the level reaches the threshold value, the device will transmit the status along with the corresponding given unique ID. This information is accessed by the concerned person, i.e., person who assigned for that task. Hence, he will be able to take immediate action.

Prof. Indu Anoop, Ayush Jain, "IoT based Smart Waste Management", 2017.

Often in our town we tend to observe that the trash bins or dustbins distributed at public places are overladen. It creates unhealthful conditions for folks likewise, as appearance to it places exploit dangerous smell. To avoid such things, the projected project is implemented to enforce for economic waste management victimization IoT. These dustbins are interfaced with Arduino-based mostly system having ultra- sonic wireless systems at the side of central system showing current standing of garbage, on mobile internet application with robot app by Wi-Fi. Thus the standing are going to be updated on to the App. Major a part of the projected project, depends upon the operation of the Wi-Fi module; essential for its implementation. the most aim of this project is to scale back human resources and efforts at the side of the sweetening of a wise town vision

Raffaele Carli, Mariagrazia Dotoli "Measuring and Managing the Smartness of Cities: a Framework for Classifying Performance Indicators".

Because of the continual increase of the globe population living in cities, it's crucial to spot strategic plans and perform associated actions to form cities smarter, i.e., additional operationally economical, socially friendly, and environmentally property, in a very price effective manner. To attain these goals, rising sensible cities ought to be optimally and showing intelligence measured, monitored, and managed. During this context, the paper proposes the event of a framework for classifying performance indicators of a wise town. It supports 2 dimensions: the degree of sound judgment of ascertained variables and also the level of technological advancement for knowledge assortment. The paper shows an associate application of the bestowed framework to the case of the city-municipality (Italy).

Samir Atkar, Abhishek Aryan, "Garbage Collection System Using IOT", 2017.

Internet of Things can play a very crucial role in today's lives in making cities safe, green and clean. By connecting peripheral devices, objects, vehicles and infrastructure around we can improve safety, cleanliness and quality of environment quality of our life, i.e., by using IoT (Internet of Things). This motive can't be achieved without intelligent technologies, i.e., IoT. Hence, to achieve this aim this system has been developed namely "IoT Based Intelligent Bin for Smart Cities". Waste management is one of the major applications of IoT. In this system sensors are connected to all the bins that are installed at different places. It senses the level of garbage in the dustbin. When it reaches a threshold value a message is sent via GSM to the assigned person to clean that garbage as soon as possible.

III. PROPOSED SYSTEM

In this system we are using IoT (Internet of Things) based technique for interfacing between transmitter and receiver. This proposed "Smart Waste Management System using IoT" gives the current state of the dustbin. It measures the current standing of garbage and showing to web application by wi-fi. After checking the status of dustbin admin will inform to

concerned person to clean the dustbin. The proposed system is described in Fig.1 Ultrasonic sensor (Fig.3) interfaced with Node MCU (Fig.2) fixed on top of the dustbins that sends data through the WLAN to admin module and also to android application. Major a part of the projected project, depends upon the operation of the Wi-Fi module; essential for its implementation.
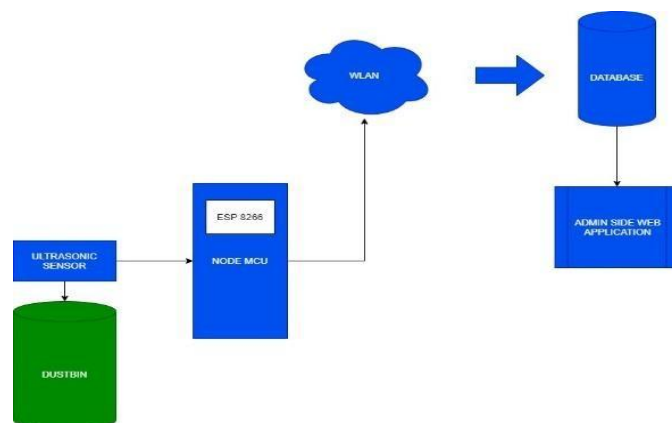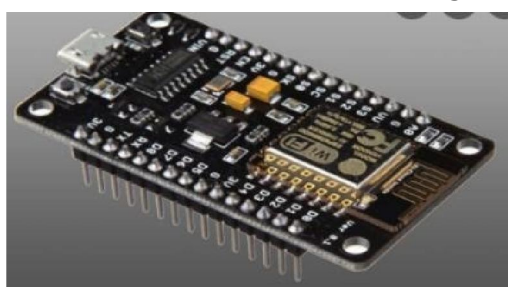

Figure 1: System Architecture

Fig.2 Node MCU Controller

Fig.3 Ultrasonic Sensor

3.1 Admin Dashboard

In web application admin will login by using given name and password. The admin dashboard has a map which displays the current status of all installed or active dustbins. The admin can add or remove dustbins. While installing new dustbins admin will add latitude and longitude of that area.

User posts will also be displayed on admin dashboard, i.e., where dustbins are not installed and there is a trash, then user can send photos of that trash to admin and this information will be displayed on admin dashboard.
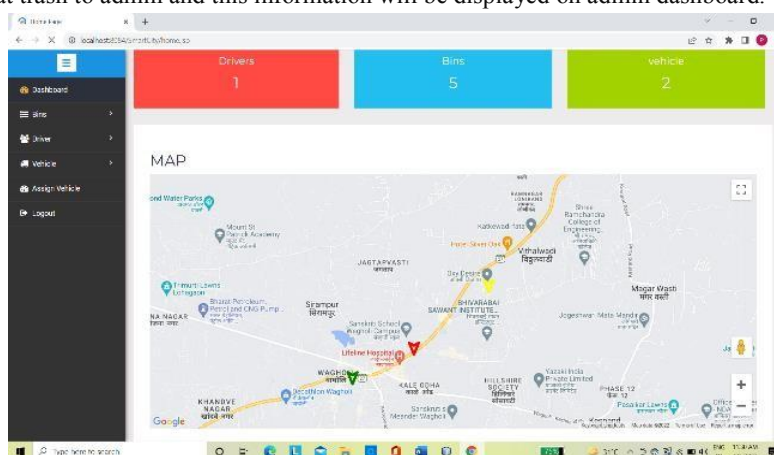

Figure 4: Bin Details Map

3.2 User Application

In the android application users can login by username. In this application we have implemented two features:

1. Android application has map through which users will also be able to see empty nearby dustbins; hence, they can easily find out empty dustbins by using android application.
2. Often we observe that even if there is no dustbin Install people throw garbage anywhere; hence, in android application there is browse option through which users are able to send photo of that trash. These photos and location of trash will be store on admin portal; hence he can take appropriate action.
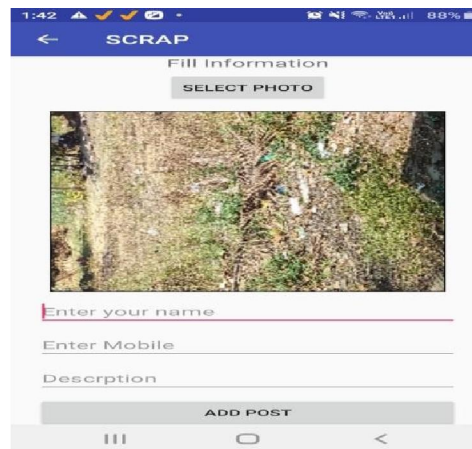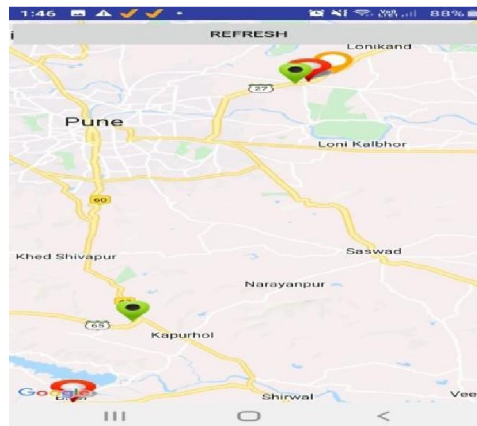

Fig.5.2 User Application

Fig.5.2 User Application

The proposed system can also be understood by using a flow chart diagram **(fig.6)**

Ultrasonic sensor detects the filling level of dustbin.

1. If the dustbin's status is 2, it will display the dustbin as red; i.e., the dustbin is full-filled..
2. If the dustbin's status is 1, it will display the dustbin as yellow; i.e., the dustbin is half-filled.
   If the dustbin's status is 0, it will display the dustbin as green; i.e., the dustbin is empty.
   If (bin1<4) then status=2
   If (bin1>4) && (bin1<6) then status=1
   Else
        Status=0
3. If admin gets to know that dustbin is in red color (full) admin will inform to the corresponding person to clean the dustbin. In that way the dustbins will be cleaned on time.
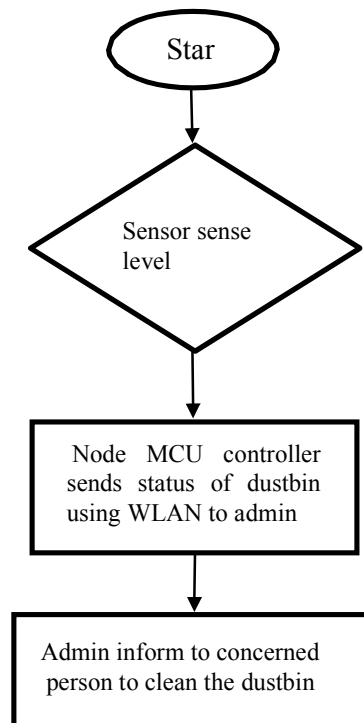   The status of the dustbin is sent to website through wi-fi.

Figure 6: Flowchart of the system

IV. CONCLUSION

In this paper, we proposed a new solution to improve waste collection efficiently using the Node MCU Controller and Ultrasonic sensor. In this proposed system, the garbage overflow can be prevented or avoid. This system is able to provide the details when the bin gets filled with trash. Hence, the most aim of this project is to scale back human resources and efforts at the side of the sweetening of a wise town vision

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