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Smart Waste Management System Based on IoT

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Abstract - The 21st century is technological development. Cisco: Enterprises Are Leading The Internet of Things Innovation, An estimation by Cisco says that more than 50 billion devices will be connected to the internet in the 21st Century. For the betterment of India, the internet of things plays the most important role. Devices are connected and used for the purpose of safety and quality of life, the city is surrounded by vehicles and infrastructure. System integrators, technology providers, and network operators are used in the working of the government to give the smart solution. On a standards based communications platform, it is difficult to generate the solution. Hence we proposed a solution for garbage collection management based on providing, IoT prototype with sensors. It will make things to become "SMART" and influence the lives of humans. Data can be read, collected, and transmit large amounts of data over the Internet. As technological advancement increases in urbanization, industrialization, and population governments across the globe will need to devise sustainable development plans. In recent years the government is investing huge sums of money towards establishing smarter cities because the notion of Smart City has been trending across the globe. A Smart Waste Management System makes a smart city and the Nation key is "Smart City". In this project, we are going to use the sensors and other components to make the smart dustbin which helps to make clean India and green India also helps to reduce the diseases that occur due to waste.

Keywords - IOT, NodeMCU, RTC, Ultrasonic Sensor, wi-fi, power supply, Load sensor, solar panel.

1.INTRODUCTION

In areas like urban and rural as the population is increasing, this results in the increasing solid waste so that waste management becomes a global concern. In order to manage this overflowing garbage, we need to take the right decision. Garbage generalization has three main types of sources viz. residential, commercial, and industrial. In the case of garbage present in restaurants, malls and other commercial establishments can be collected directly from the unit using vehicles. Industrial garbage in which waste is produced in construction sites, various industries can also be disposed of using different ways. The Internet of Things concept is being used for the handling of this waste like collection and disposal, which mainly deals with sensing, actuating, data gathering, storing, and processing by connecting virtual and physical devices to the Internet. The change in the lifecycle of the people is one cause which makes an increase in the levels of waste generation. Serious challenges have occurred due to this. The waste management schemes that are present, are not enough to handle the ever increasing levels of waste. Inefficient waste management techniques have given rise to the possibility of such kinds of problems. The system is inefficient as the cleaners are not aware of the garbage collected in the dustbins before reaching the actual spot. Sometimes it may happen that the garbage in the dustbin is full or sometimes it may be not up to the level where it needs to be emptied. Hence it reduces the efficiency of the system. To overcome this problem and to form the Waste management system efficiently we've developed a sensible Dustbin concept.The smart dustbin uses a NodeMCU as the microcontroller. An ultrasonic sensor is used in order to detect the level of garbage filled in the dustbin. An RTC module is used for registering a time stamp. All this data is sent to an Android app that has an inbuilt QR Scanner for ensuring Garbage Collection and Disposal.

2.PROPOSED METHODOLOGY

1. NODE MCU is the main component used in this project which has multiple sensors also provide benefits to reduce the cost.

2. An Ultrasonic Sensor is used to determine the level of garbage in the dustbin It determines the current status of the dustbin.

3. An RTC is used in order to keep a note of the time at which the dustbin was last cleared.

4. The device would be powered by a USB charger as well as it can be operated using solar power.

5. The android app for the Smart Dustbin will have data like garbage level, last cleared time and battery level of the device.

6. The android app will be developed by using MMIT App Inventor.

3.LITERATURE SURVEY

The literature surveyed some different papers to get information about the existing work which have been done by SauroLonghi,David Marzioni, EmanueleAlidor, Gianluca Di Bu`o, Mario Prist, Massimo Grisostomi and MatteoPirro. Proposed refuse collector supported by using sensor motes which is providing information and standing about the bin and also sending the retrieved data through DTN (Data Transfer Nodes). This bin features a custom prototype rather than basic installation of sensor nodes. A wireless sensor network is helped for controlling the bin by gathering data from motes. The limitation here is that the knowledge about the bin isn't directly transferred to the server or to the client; it needs to be sent through the Data Transfer Nodes. Shubham Thakkar, R.Narayana Murthy, in this paper using the Near Infrared Reflectance (NIR) spectroscopy we can identify the type of plastic. The alienated dissipated equipment from MSW (municipal solid waste) can be placed in a needy area. By Using a dissenter material which can be mixed into a uniform material. The entire process is repeated every hour. The fermentation mechanism happened during a sealed atmosphere, where bacteria converted into undividable enzymes which ended up in biogas Andrei Borozdukhin, Olga Dolinina and Vitaly Pechenkin, this proposed system consists of two parts: special signaling equipment and software . The equipment is placed on the side walls of the bin which consists of two parts: one is that the receiver transmitter and sensor. Sensor is employed to point the extent of the bin which is connected to the transmitter that transmits a sign of fullness of the bin to the receiver at the server host. A manager is appointed at the server side whose job is to seek out the shortest route and intimate it to the teamster to gather it during a short interval of time. Thompson A.F, Afolayan A.H, Ibidunmoye E.O Done work on the internet based platform for the organization and monitoring of waste collection, discarding and carrying etc. This consists of the client, server and storage. The client is the device which can access the pages and forms used by web applications e.g. PDAs, phones, laptops etc. the desktop is a program that launches the application and makes it perform over the internet. In this, the backend system is the web server and management system that supervises the info employed by the function to watch the movement of knowledge between user and system. The limitation of this paper is that it only shows the location of the bin within the webpage . To minimize the traversing cost and number of vehicles required to meet the total demand also Detect the garbage level and display Battery status in android app time stamp when garbage was lastly clean.

AIMS AND OBJECTIVES:

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4. RELATED WORK

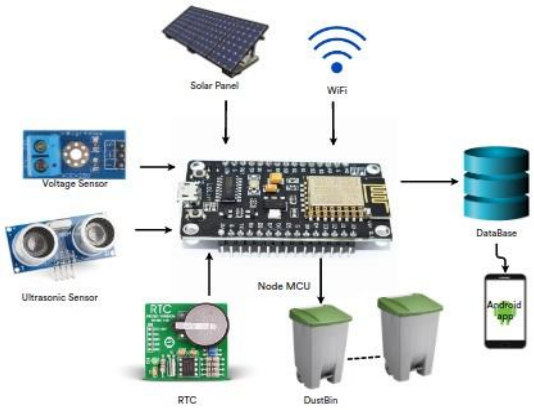

Fig 4.1 Architecture of smart dustbin

We propose a smart waste collection system based on the level of wastes present in the waste bins. The data obtained through sensors is transmitted over the Internet to a server for store and processing mechanisms. It is used for monitoring the daily selection of waste bins, based on which the routes to pick several of the waste bins from different locations are decided. Every day, the workers receive the update optimized routes in their navigational devices. The significant feature of this system is that it is designed to update from the previous experience, looking some practical and decide not only on the daily waste level status but also the predicted future state with respect to factors like traffic congestion in an area where the waste bins are placed, cost-efficiency balance, in ran and other factors that are difficult for humans to observe and analyze. Based on this historical data the rate at which waste bins get filled is easily analyzed. As a result, it can be predicted before the overflow of wastes occurs in the dust bins that are placed in a specific location. Depending on economic requirements specified at early stages, the optimized selection of waste bins to be collected is expected to improve collection efficiency.

Shows the system overview, whose components are as follows:

- **Ultrasonic Sensors**: We can observe the waste level by measuring the distance from the top of the trashing to the waste by sonar.

- **Real-time clock (RTC)**: RTC is used for updating time and date. It displays the data on the android application.

- **Voltage sensor:** Voltage sensor used to determine, monitor, and can measure the supply of voltage.

- **Solar panel**: : A solar panel is design to absorb the sun's rays as a source of energy by using sun rays to generating electricity. In case the power supply doesn't work then a solar panel is used.

- **NodeMCU:** It is an open-source IoT platform. The term NodeMCU by default refers to firmware rather than development kit.

- **Power supply:** It provides an electricity supply.

- **Android App:** It provides current information on date and time related to the cleaning of garbage.

5. PROPOSED SYSTEM

According to the need for growing technology waste can be smartly managed hence we have proposed the smart dustbin but it becomes expensive. We overcome this disadvantage by making use of NODE MCU which has a small size and there is no need for external wifi connectivity this makes the application efficient.

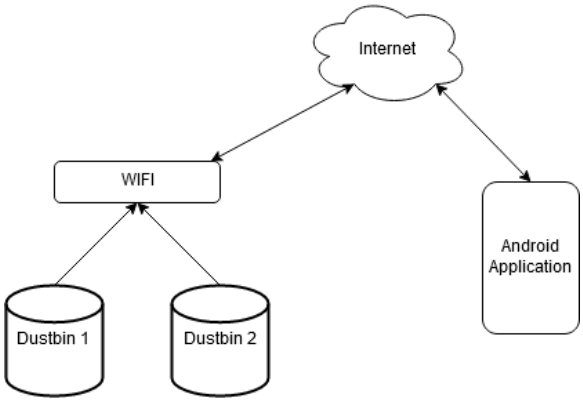

Fig 6.1 Working of the system

The above architecture shows the working of the smart dustbin using sensors. In this architecture a small device is placed on the dustbin. This device makes the dustbin to work smart. The main aim of the system is to monitor the garbage and make India clean. The device consists of different components such as solar panel, ultrasonic sensor, power supply, RTC, nodeMCU, etc. This device detects the current status and other information this detailed information displays on the android application. Through the internet device with a sensor connected to android app shows the detailed information such as current status of garbage, time, date, day of cleaning and also percentage of garbage that it shows in how many percentages the dustbin is clean. This system helps to monitor and reduce the efforts. Another feature we add scanning of the code when the worker makes the dustbin empty and scans the code automatically the superior got the update that the garbage is picked up after the worker reaches the destination he will again scan the code and this will confirm that garbage is properly reached. Due to this monitoring is becoming too easy and work becomes more efficient and smart. In case the power supply is not done then we have used it as a backup i.e. solar panel. This will work as a backup to the system. It provides an electric power supply to the device.

7.CONCLUSION

We have introduced an intelligent waste management system. The system design is totally IOT primarily based sensors. It is responsible for measuring the waste level in the waste bins and later sends this data (through the Internet) to a server for storage and processing. This data helps to compute the optimized collection routes that's why workers' work makes it easy. This paper shows the technical way to manage waste. Smart dustbins can be implemented by making the use of sensors. The accurate data from real-time collected by the system. The smart dustbin prototype can be used in any conventional dustbin and make Waste Management easier and efficient.

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