

Waste Management Using Internet of Things in Smart Cities: A Survey

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Abstract- Nowadays in many smart cities we can see that, several garbage bins in various places gets filled with garbage, left uncleaned. People in the houses too store the domestic wastages even though it has been filled. Since this has become the reason for spreading of diseases over the places, some methods should be taken, which will include the waste collection in effective way. This waste collection technique must be implemented by the way that human power is used hardly. On account with all these points, waste management is done with powerful technique called Internet of Things. This technology, which is upcoming nowadays in all sectors uses different sensors for different purposes. The sensors used in this waste management project senses and provides the measurement of the garbage present in the bin. This result of the level of garbage in the bin will be taken to the server for continuous updation. When the threshold level of the bin reaches, the lid of the bin will get closed automatically. Then these garbage can be cleaned by the authority. Hence all these can make happen with the help of technology called Internet of Things.

Keywords- Smart Dustbin, Internet of Things, Microcontroller, GPRS, Smart Cities.

I. INTRODUCTION

Nowadays, internet and the applications of internet has become essential part in our life. On the increase in population of humans and also the basic necessities of human demand, several researches has been made by researchers to connect the computers into the internet. Final thing happened as a result was Internet of Things. Though it is an older concept, still it is in the initial stage. Home automation system and transportation are the areas where there is a rapid growth of Internet Of Things. Since IOT is based on internet or done through internet, it should have an ideal and speed internet connection to achieve the work to be done in effective manner. These technologies can be explained generally as a connection that has been made between humans-Computers-things. In this way all the equipment that we are using in our day today life is

controlled and monitored using Internet Of Things. Mainly in IOT sensors are the major essential things used. Sensors are deployed in every places and those sensors converts physical data into digital signals by sending the necessary information to the control centres. This provides the way for remote information gathering. In Waste Management systems, cleaning of wastages at regular intervals will provide better way to be free with any kind of diseases.

Though it is the solution, manual supervision and tracking the status of the bin is impossible and ineffective. An answer to this problem is clearly mentioned and explained in this paper which involves the usage of wireless networks that generally uses sensors providing complete details. All these solutions to the problem are found and implemented using the current trending technology called Internet Of Things which essentially reduces the necessities of human resources by automating it with wireless devices called sensors. Sensors which are available in different varieties can be made used based on their own usage.

Sensors play a major in this project which will senses and provides the measurements of the dust materials available in the smart dustbin. The Embedded devices which are connected to Internet and it can also be controlled from the internet is known as Internet of Things. In this system, internet connection is provided for monitoring the garbage bin which gives accurate measurement. To avoid some deadly diseases there is a need of absolute waste management system. By continuous monitoring of the status of the smart bins which takes their decisions that helps to manage the smart dustbins. There are lot of dustbins placed around the city or within the infrastructure. These dustbins are connected with Infrared sensors with microcontrollers. Transmitter transmits the data based on the smart dustbin level. Within the cloud infrastructure the data which are received, analyzed and processed which display the status of garbage in the dustbin on the GUI on the web browser. Nowadays, we may see that in every place many diseases and unpredictable illness are spreading due to improper management of waste materials

over the cities. It is mandatory to take some measures which will help everyone to be free from diseases. Since we have updated technologies nowadays, it is possible to make it happen. Internet Of things paves a way to make this happen. After finding IOT is providing its grip in our lives, this waste management in smart cities idea has been transformed into this project by implementing with several sensors which will help us in reducing environmental pollution and keeping the surroundings free from any harmful things.

II. LITERATURE REVIEW

In this section the various surveys about the IOT usage in Waste Management using smart dustbins has been clearly explained. Though many technologies give the solution for the problem for waste management, IOT stands first based on the review. This is an idea of designing a smart garbage bin with IR sensor and Wi-Fi module for transmission of data.

In the paper proposed by authors Nalavadi Srikantha, Khaja Moinuddin, Lokesh K S, Aswatha Narayanat, the idea of implementing the smart dustbin with IoT and details about IoT has been taken. Since IoT mainly deals with hardware sensors and different types of sensors that can be used for waste management has been clearly described here. Specifically a focus on smart devices adoption enabling technology in waste management has been done. The strength and weakness of various model to reveal their characteristics has been reported [1].

In the paper proposed by authors, Parkash and Prabhu, details about the location of multiple dustbins throughout the cities or the campus with low cost embedded devices that will help in tracking the garbage bin levels and a unique ID for every dustbin in the city is provided that which will give the details about the level of the garbage bin located at appropriate location, has been taken. When the limit reaches the threshold level the particular garbage bin will transmit the measurement of the dust available along with unique ID provided for appropriate dustbin in particular cities. With the referenced information of the garbage provided with unique ID of it with particular cities immediate actions are taken to clean the filled garbage bins [2].

In the paper proposed by authors Tarandeep Singh, Rita Mahajan, Deepak Bagai, idea for a system which monitors the garbage bin level and providing the information about the measurement of garbage bin to the concerned authorities who will manage the collection intervals for cleaning the bins and making it available for reuse, has been taken. A three tier waste management system that includes intelligent bin, gateway, remote based stations. The

parameters of the bin that are continuously monitored and transmitted through a gateway to the remote station that to be stored in a database by making servers updated in continuous fashion. A clear and well defined idea of using wireless devices at home stations has been obtained through this paper [3].

In the paper proposed by authors, M.S.Killedar, S.S.Navghane, V.M.Rohokale the idea of interfacing the dustbins with the microcontroller having infrared systems which shows the current measurement of level garbage through a browser in HTML pagewith the help WIFI wireless transmission medium has been taken. Hence the status of the smart dustbin will be continuously getting updated on the HTML page. [4].

In the paper proposed by authors Indhu Anoop, Ayush Jain, Shwetha Pathak, Gauri Yadav, idea of interfacing the dustbins with the help of Arduino based system enabled with ultrasonic wireless systems along with central system which shows the present status of garbage, by using mobile application with android application by using Wi-Fi module. Therefore the updated status is made to be displayed on the mobile application. The vital part of this project depends upon the Wi-Fi module working which is very essential for the implementation. The prime goal of this project is to reduce human efforts. This helps our country to make it smarter city [5].

In the technique proposed by authors KairnbayMagzhan, Hajar Mat Jani, idea of how dijkstra's algorithm is preferred over other algorithms. This waste management using IOT project mainly deals with collection of garbage from the dustbin, shortest path from the dustbin to the authority to be calculated and it has to be provided for the authority for appearing to the location in the short period of time. This paper concentrates in the calculation of minimum time for reaching the location of the dustbin by the authority [6].

In the paper proposed by authors, VikranthBhor, PankajMorajkar, MaheshwarGurav, Dishantpandya, design and the additional details required for management of smart dustbin, while collection of garbage by the authority has been taken. This paper provides the various details about the collection of garbage from dustbin after it gets filled and its removal from the dustbin and making it reusable which makes it beneficial [7].

III. RESEARCH METHODOLOGIES

Apart from creating ugliness and stinking smell to the environment the overflowing dustbins also create numerous number of health issues. To overcome this current situation of our environment the paper proposes a smart dustbin using IOT. When the dustbins are about to reach the overflow level, an update will be sent to the server. On receiving the message from the garbage bin about the overflowing status, an alert call will be made to the municipality or the concerned authority. Immediately the concerned authority will clear the garbage and send a status to the server and making it available for further usage.

Since few decades, the garbage has been overflowing before cleaning. The overflowing garbage bins were previously monitored manually which had many driving back problems. The plastics and other intoxicants when dropped inside the dustbins most of the time land up being dropped outside or the filled garbage bin overflows the excess outside the bin causing tidiness all over. In the growing world of technology this automatic dustbin monitoring system has been proposed.

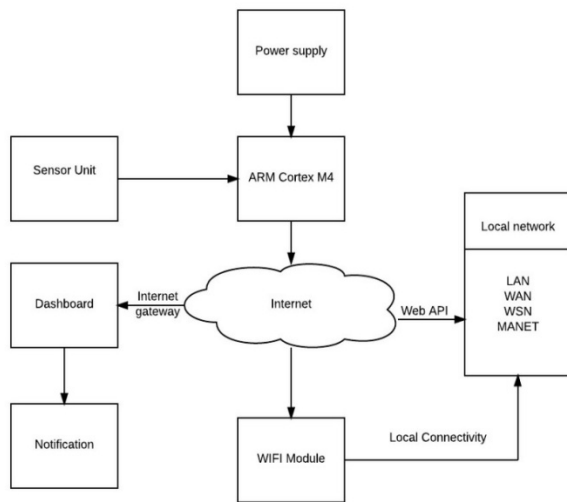


Fig 3.1 Architecture Diagram of the Proposed System

POWER SUPPLY:

Power supply unit is the main source for embedded modules to work with real time systems. It has power unit for controllers and other module. This is the main unit for hardware module.

MICROCONTROLLER:

Microcontroller is the main part of the system. It has number of features and it is controlled over all process. It can

be coded and loaded to the controller for controlling processes.

RFID SYSTEM:

Radio Frequency Identification, RFID works as a smart card. It works like an ATM card which retrieves and stores the data of the garbage bin.

LCD:

Liquid Crystal Display(LCD) is used for displaying the measurement of the trash in the garbage bin.

INFRARED SENSOR:

Infrared sensor is for identifying the object between the transmitter and receiver. It is used for sensing the level trash level. An IR sensor consists of an emitter device, detector device and associated circuit board.

Wi-Fi:

Wi-Fi is used here for wireless transmission of the level of the garbage available in the garbage bin. This plays a major part which performs a major work in this proposed system.

SERVER UNIT:

Server is the computer machine which holds the information of the level of the garbage available in the garbage bin. Server gets updated continuously for every minute at the time of usage of garbage bin.

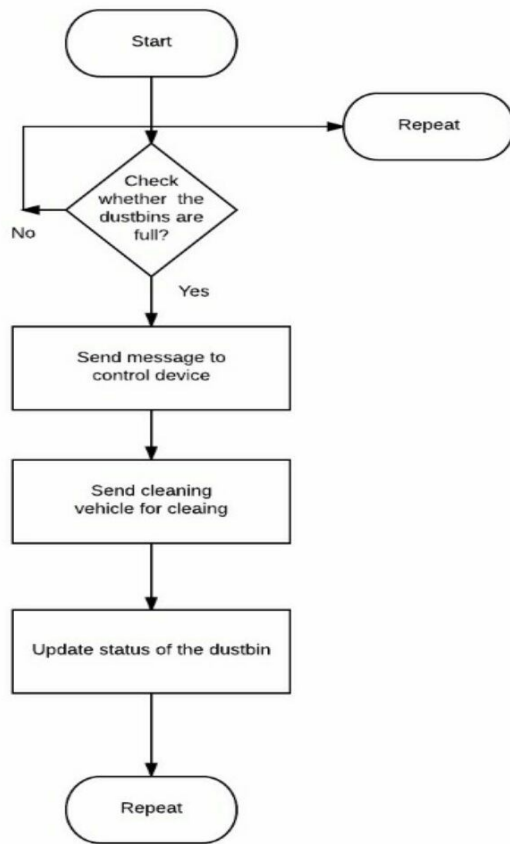


Fig. 2 Flowchart Diagram of the Proposed System

IV. CONCLUSIONS AND FUTURE WORK

Thus, the real time Waste Management system in Internet of Things Technology is implemented with different sensors. By implementing this system, human resource can be reduced and manual supervising to the dustbins has been reduced. Since it is automated, it is a timely process which will not lag in times.

The future work of the system can be done with the time stamp which may include the time at which the dustbin has been filled and what time the authorities collect the dusts and reloads it for next time usage.

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