IoT Garbage Monitoring using Raspberry PI

Mr. Gajanand Sariyam

Senior Lecturer, Department of Electronics and Telecommunication

Government Womens Polytechnic College, Jabalpur, M.P., India

gajanandsariyam@gmail.com

Abstract: In India, our P.M has started a mission called SWACCHA BHARAT ABHIYAN, Which aims to clean up the roads, streets and to develop the infrastructure digitally of India's cities and rural areas. Focusing towards the clean India mission, we have provided an efficient solution for monitoring the garbage level on the real time. Whole system is IOT based. The level sensors in the garbage bin detect the garbage level continuously and accordingly the system provides the information to the municipality office. This will avoid the overflowing of the garbage bins. Ultimately it will help us to keep our environment clean and also reduce the health issues. A web page is built to show the status to the user monitoring it. The web page gives a graphical view of the garbage bins and highlights the garbage collected in color in order to show the level.

Keywords: IOT, Cloud, GPS, ID, IR sensor, Raspberry-Pi, GSM, SWACCHA BHARAT ABHIYAN

I. INTRODUCTION

The overflowing of the garbage bins is very common in India, but this will impact our society, our surroundings. It will damage the environmental values that lead to cause the pollution along with the health issues for human and other animals also. We proposed an IOT based cost efficient garbage monitoring system which will monitor and alert when the garbage level crosses the threshold level of the garbage bin. This process will be carried out with the help of sensors, microcontroller and ESP8266. It will also provide the GPS link along with the alerting text message to find the shortest path of the mentioned bin ID. This will reduce the human efforts, also Later it will be implemented for other mobile operating system. Reduces fuel consumption.

Figure 1- overflowing of garbage bins

II. LITERATURE SURVEY

Huy Hoang Nguyen Centre for Health Technologies, Faculty of Engineering and Information Technology, University of Technology, Sydney, Broadway, NSW 2007, Australia Tuan Nghia Nguyen Centre for Health Technologies, Faculty of Engineering and Information Technology, University of Technology, Sydney, Broadway, NSW 2007, Australia Ray mont Clout Centre for Health Technologies, Faculty of Engineering and Information Technology, University of Technology, Sydney, Broadway, NSW 2007, Australia Alexander Gibson Centre for Health Technologies, Faculty of Engineering and Information Technology, University of Technology, Sydney, Broadway, NSW 2007, Australia.

Seven reports were reviewed in detail for the literature review, with the majority of these providing some evidence to support the theory that the introduction of waste collections is associated with a reduction in waste arisings. Internet of

Things (IoT) has attracted widespread applicability not only limited to smart cities and communities but also in water, waste management and so on. In the perspective of waste management, several different IoT-enable solutions have been proffered with each having its own strengths and weaknesses that requires improvements.

Folianto, et al. proposed a system that identifies the when a litter bin is completely full. In this system, data is collected and transmitted via a wireless mesh network. Moreover, to reduce the amount of power consume and maximize the time efficiency of the operations, the system employs duty cycle technique. The technology has achieved a widespread application in which cities waste management is not an exception. In this paper, we have discussed several works on smart waste collecting systems as IoT-enabled solutions for smart cities waste management.

Navghane also proposed a smart waste collection bin using the combination of sensors such as weight and infrared (IR) sensors. These sensors are equipped with the capability of sensing the weight and different levels of garbage respectively. In this case, the IR sensors will show the various levels of garbage in the dustbins and activate the weight sensor to transmit the results ahead when its threshold level is reached.

Chaware, proposed a waste collection system considered innovative to assist in keeping cities clean. The system operates by monitoring garbage bins and notify the authorities and the garbage collection vehicles about the level of garbage stored or contained in the garbage bin through a web application.

III. EXISTING SYSTEM

In the existing system, the garbage is collected by the municipality servants on the scheduled routine basis i.e. weekly or 2-3 times within the months. As we see many times that garbage bins are placed in the public places in the cities are overflowing due to increase in the waste every day. Due to this, the garbage shrinks and produces the bad smell which will tends to cause the air pollution and spread diseases. That can cause the harm to human health. Thus cleaning is the big issue. Also finding the path of garbage bin is one of the task especially for new driver. Thus to avoid such conditions we have designed the improved system.

IV. PROPOSED SYSTEM

In our proposed system, which is the IOT based smart garbage monitoring system along with the GPS link, there is the real time monitoring with alerting facility. Here in our purpose system we have used Raspberry-Pi module, GSM module and also using GPS antenna. In addition to this, we are using bin compression technique which compresses the bin when it is overloaded and it also gives the notification that it has been compressed.
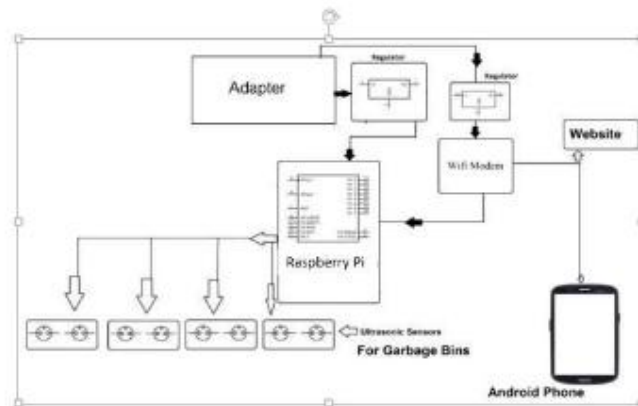

Figure 2- Block Diagram of Raspberry-Pi

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V. MODULES DESCRIPTION

(i) Android Devices- Generally, AOS devices are available with a merger of open source programming and proprietary software but with AOS source code released by Google Inc. under the open source licenses agreement. Originally AOS was developed by Android Inc. in October 2003 that Google supported financially and later purchased it in 2005. Android was revealed in 2007 for conjunction with the founding of the Open Handset Alliance; an association of hardware, software and telecommunication companies dedicated to moderate open standards for Smartphone and other cellular devices

(ii) GPS- Smartphone Global Positioning System (GPS) enables navigation for the devices that precisely determines geographical location by receiving GPS co-ordinates information from the GPS satellites. Originally, it was only used by the United States military, but later this service is available freely worldwide and now most receivers are integrated into Smartphones, PC tablets, airplanes, tracking devices and automobiles. Now, the people feel more convenient to just use their Smartphone built-in GPS as navigation tools instead of separate GPS device. Smartphone navigation mostly gets free and speedy automatic updates when compared with commercial GPS devices.

(iii) Raspberry pi- It is a credit-card sized computer that plugs into a computer and uses a standard keyboard and mouse. Raspbian is the "official" operating system of the Raspberry pi, which also stores the programming code to execute for using Google Maps into Smartphones application.

Figure 3- Raspberry pi Circuit

(iv) GSM- Global system for mobile communication is an open and digital cellular technology used for transmitting mobile data services. It is used for accessing the time division multiple access.

VI. WORKING

IOT based smart garbage monitoring system using ESP8266 is very simple and real time. Basically the process starts from the garbage bin. IR sensors are fixed on the each level of the garbage bin. Here we are taking the 5 levels of the garbage bin for our project demonstration. We are providing the unique ID for each garbage bin. Also we are selecting the threshold level for alerting purpose. Garbage level is sensed by the IR sensors. As soon as the garbage in the garbage bin crosses the threshold level, the alerting text message will get provided to the concerned person or in the municipality office. This message contains the garbage bin ID along with the GPS link. This GPS link will help to find the shortest path of that garbage bin. This is helpful especially for new drivers of that municipality vehicle. Block diagram shows the working of the system. Basically there are five main parts of the whole system. Power supply part, sensing part, processing part, uploading to the server/cloud, and the alerting part. IR sensors, senses the garbage level and accordingly sends the signals to the AVR microcontroller. Also the GPS co-ordinates of the garbage bin are provided to the microcontroller. AVR process the received signal and passed further to the Raspberry Pi. As our system is IOT based, the alerting will get taking place with the help of IOT. Due to this GPS module is removed. The alerting

message with the GPS link has no need to use the GPS antenna because we can feed the co-ordinates of the garbage bin in the programming part as the position of the garbage bin is fixed. In this way when garbage crosses the threshold level, the alerting message will get continuously send until the garbage in the garbage bin is removed by the concerned person. In this way our whole system will work. For the power supply, we are using the solar panel here along with the battery backup.

Figure 4- Battery Backup

VII. RESULTS AND OUTCOME

Figure 5- System output on the LCD Display

Figure 6- Screenshot of Alerting Message

VIII. CONCLUSION

This research work was conducted in two steps. The first step is informative survey and it conducted to gather the latest information about hospitals and doctors. This paper introduced the IOT based smart garbage monitoring system using ESP8266 with the GPS link. It will provide the improved efficient solution to the waste management issue over the previous systems. This will responsible to reduce the health related issues and putted the best example for real time garbage management system.

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