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Automation of waste collection using IoT

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Abstract--*Due to the increased population rate the urban area is more polluted compare than village. Garbage collection is a very challenging task in this current scenario. Most of the dustbins are contains large amount of wastages dumped over their capacity level. Finally, the particular place becomes a dirty place. The main aim of this proposed system is to maintain cleanliness in our surroundings. This garbage collection system will reduce overflow of wastages from the dust bin using current communication technology concepts. In this system ultrasonic sensors are used to find the level of the garbage's in the dustbin. If the garbage level is more than the set point level the particular LED bulb will glow and the alert message also send to the concerned members using GSM and GPS technology.*

Keywords-- *Internet of Things (IoT), IR Sensor, Ultra Sonic Sensor, WI-FI, GSM, Trash Bin.*

I INTRODUCTION

In this modern world dustbins are gets overflowed due to improper cleaning schedules and laziness of cleaning people. Cities around the world are facing critical challenges due to increased urbanization. The foremost reasons for the overflow of garbage are over population. As the people in urban areas increases the maintenance of garbage is improper. Public waste bins are filling up faster than ever and inevitably many of the bins end up overflowing before collected causing not only bad odors but also negative health impacts and environmental problems. The overflowing and unclean garbage becomes a breeding ground for mosquitoes and insects. The people in those surrounding areas are also affected by cholera and dysentery. All organisms produce many wastes but none produces wastes likes human society wastes arises because of different activities. Communication technology plays an important role in our daily life. Due to the people's busy life it is difficult to spend time for disposal of wastages or monitor the filling level of dust bins.

So, to avoid this kind of impacts the technology has developed solution smart dustbins. These dustbins can identify the particular time at which the garbage should be cleaned the dustbins are processed with the help of ultrasonic sensors connected to LED lights. When the dustbins are filled, the ultrasonic sensor detects and sends the messages to the concerned person. The LED is used to show how much the dustbin has been filled. So, using this smart garbage technology the environment is not easily produced and also society does not face any impacts due to this. So, using LED we can be get aware to clean the garbage at correct time before overflowing. The major objective of the proposed system is to monitor the dustbin continuously without the interventions of humans. This system front end interface is implemented by using PHP and the database system is created and maintained by using MYSQL database.

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The second section of this article describes the various existing technologies used to collect the garbage's. Section three deals with the proposed architecture diagram and various technologies incorporated with this system. Section four shows the proposed system sample output screen. Section five concludes this proposed system.

II RELATED WORK

Thiyagesan M et al., says that due to the development of technology everything in the world became a smarter. Due to the motivation of smart city, smart garbage management is necessary in our country. The authors designed a new device to collect the garbage's from various places such as colleges, hospitals airports etc. They are not designed a new system but they are modified an existing normal dustbin with the help of embedded system. This embedded system is making the normal dustbin as a smart one. In this new device sensors are used to identify garbage level detection and routing it automatically. This device was executed automatically without the help of human beings [1].

M N Rajaprabha et al., explained about the importance of smart cities. Smart cities provide the comfortable life to the people. These smart cities are constructed by using a variety of materials. In urban area the population rate is also increased day by day. Due to this reason large amount of solid wastages are disposed. Without using the proper disposal methods, the air, water and lands will be polluted. To overcome this problem in cities IoT based smart garbage collector was introduced by using current technologies. In this system the data has been stored in the cloud environment [2].

Vishal Dudgikar et al., described about their new device used to collect the solid wastes from various places such as gardens, parks and public places. Mostly the dustbins were filled with in the less amount of time. In this article the authors proposed a new device used to collect the dusts from the dustbins and clean the pathway also. This device was used to clean the common places automatically with fewer amounts of human resources. It was designed by using IR sensor device. The level of the wastages is measured by using ultrasonic device. RFID technique was used to control the operation of this proposed system. For cleaning the path way the broom was integrated with this device [3].

Gaurav Makde et al., discussed about the situation of current dustbin status. Most of the time the dustbins are overloaded at common places like parks, hospitals, etc. Because of this overloaded dustbin the specified place becomes dirty and it create bad odor. It leads unhealthy environment. Here the authors implemented a new garbage collector using IoT. The entire system was connected by using micro controller with ultra-sonic sensor module, GSM part etc. This browser was developed by using HTML language. The status of the garbage collector was updated on the web page. WiFi connectivity was the important module of this proposed system. The main objective of this proposed device is it reduces the human power and enrichment the vision of smart city. Dustbins are identified by using separate number. This number has been used to identify the dustbin. This ID was used to take the instant action by the concern authorities. They are constructed a smart garbage collector using sensors, ultra-sonic part, WiFi system. This device can be used to improve the city cleanliness by sending the dust level through web pages [4].

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Sumit Rathi1 et al., said that garbage collection was the critical task because it needs large amount of money and complicated running logistics. This article described the architecture design and overall picture of the proposed garbage collector. This proposed device was mounted with an existing system. The new device was connected at the top of the existing device to identify the garbage level. The garbage level was detected by using two stereoscopic cameras for detecting the level of garbage. The depth level of the garbage was detected by using image processing concept. This proposed system was constructed successfully and executed in real time [5].

Kalpana Devi, et al., designed a new Trash Bin used to separate degradable wastes and non-degradable wastes. This system was designed by using various sensors and motors. All hardware parts are interfaced by using NI myRIO. Without proper planning for disposing wastages, large amount of solid wastages is dumped around in entire world. Peoples throw the wastages on roadside, which one is not disposed properly. In this proposed device was used to divide the wastages into two categories like degradable and non-degradable with proper manner. The entire process was controlled by using various sensors [6].

Y. Nithish et al., says that most of dustbins are dumped by various materials. Due to this the peoples are spoiled their health conditions. The bad smell was also occurring from the dumped dustbins. To avoid this condition a smart thrash bin was proposed. This device was constructed by using ultrasonic sensor and Node MCU micro controller device. Sensor was used to find the level of the dustbin. The system executed based upon Arduino IDE. The level of the dust bin is sent to the concern person. This system will make the entire environment clean. [7]

Dr. Sandeep et al., explained about the importance of Internet of Things (IoT) in current situation. Solid wastes are mainly affecting the entire health condition of the society. Detection of wastages and monitoring was the major problem in current scenario. In traditional way the waste materials are collected in manual way. This proposed system was executed automatically. Here the smart dust bin was constructed by using IoT technology. This device helps to keep the entire city as clean. The levels of the dustbins are detected and send the messages to the concern authorities [8].

III PROPOSED APPROACH

In olden days the garbage was collected manually. Thatwas a very critical task. In this proposed system, it is used to detect the level of wastages on the dustbin and inform the messages to the concern people. Depending upon the level of wastages the particular LED will glow. The entire system is controlled by the NODEMCU controller. LED bulb is used to indicate the level of dustbin. The following figure 1 shows the overall architecture of the proposed system.

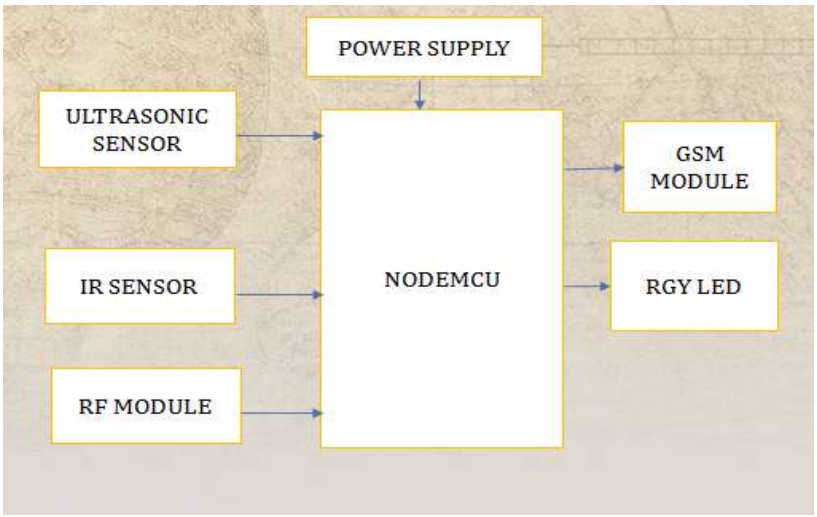

Figure 1. Overall Architecture of Proposed System

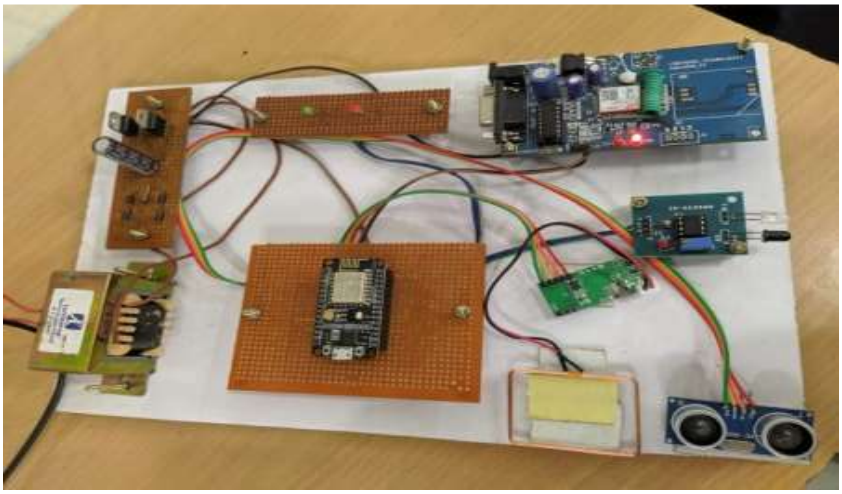

Fig 2.Prototype of the proposed system

This proposed system consists of various hardware devices like Step down transformer LED bulb, NODEMCU – ESP8266, WiFi module, RFID module, IR sensor, Ultrasonic sensor and GSM module.

Power Supply:

We have used 12v power supply in this project, the power is equally distributed based on the component, they are provided with 12v and 5v according to the necessity.

Ultra-sonic sensor:

Ultrasonic sensor transmits electromagnetic signals reflect back, to find the level of the garbage by using the time difference between transmitting and receiving the signal. This sensor contains two open places at the front. One open is used to send the signal and the other open is used to receive the signal.

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Figure 3: Ultrasonic sensor

GSM Module:

It is used for create a communication to another GSM based device. Mainly this module is used to transfer the message to the concern people when the dustbin is in overflow condition. By using this module, the concern peoples receive the messages from the smart garbage collectors. GSM is a combination of TDMA, FDMA and Frequency hopping.

Figure 4: GSM module

WI-FI Module:

This module has processing and storage capability, it combined with the sensors. The ESP8266: It supports APSD for VoIP applications. It consists of self-calibrated RF and works with all operating constraints. The entire system is designed by using PHP programming language. The database is created and maintained by using with the help of MYSQL database.

Figure 5: Wi-Fi module

RFID Module:

This module uses to detect the RFID tag of the dustbin collector and stores the data to ensure the identity of the person collecting the trash from the bins. The same data will be available in the website with the persons tag ID mentioned with time, trash removed from the bins.

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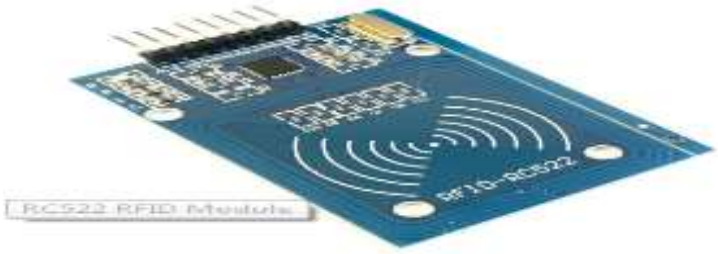

Figure 6: RFID Module

IR Sensor:

This sensor Consumes 5VDC operating voltage with I/O pins are 5v and 3.3v compliant, Ranging up to 20cm. It comes with adjustable sensing range and built-in ambient light sensor has 20mA supply current with mounting hole. It emits or detects infrared radiation to sense its surroundings.

Figure 7: IR Sensor

IV RESULTS AND DISCUSSIONS

This proposed device is used to detect the level of solid wastes on the dustbin using current communication technology devices. The ultrasonic sensor is used to find the level of the dustbin. The current level is compared with the already set level value. If it exceeds than set value the LED bulb will glow. In this system the level of the dust bin is divided into four levels.

This device is monitored continuously and alert the concern authorities when the level of the wastage is more than the threshold level and LED bulb will glow based upon the level of wastages. The dust level is reached 25% and 50% of the dustbin the green light will be glow. The dust level is 75% or 100% reached means the LED bulb glow in red color. At the same time the level of the dust bin also sends to the concerned members through GPS technology. The received value will be stored on the local server. The following screen shows show the status level of our proposed system.

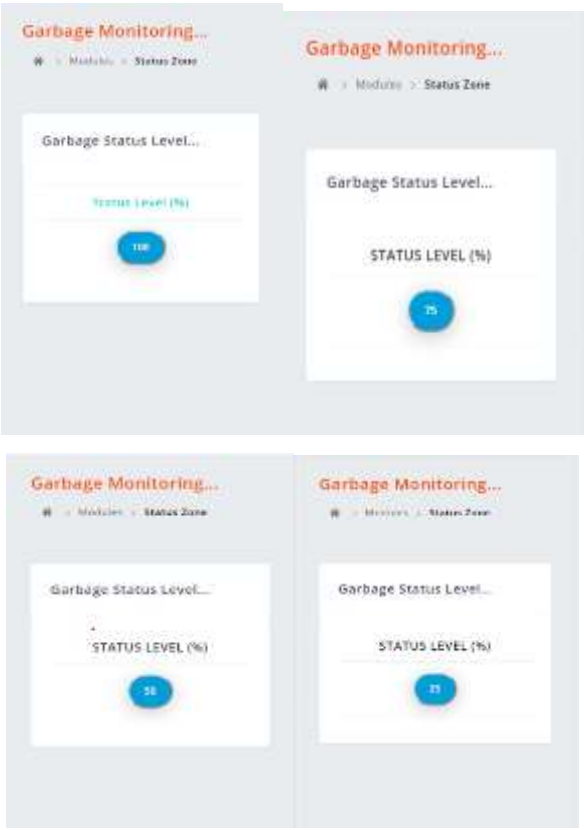

Figure 8: Status Level of the Proposed System

V CONCLUSION

Garbage collection is the very tedious task in current situation. In common places like hospitals, parks, colleges and schools the dustbins are dumped more than their capacity. Finally, the surrounding places will become so dirty. Due to this reason the peoples are affected by various health issues. To avoid such kind of issues we have proposed a new garbage collector using current communication technologies. In this garbage collector ultra-sonic sensors are used to detect the level of the wastes on the dustbin. Depends upon the wastage level the specific color of the LED bulb will glow and send the level message to the concern authorities immediately. The level of the dustbin is 25% or 50% the green color of the LED bulb will glow. If the garbage level reaches 75% or 100% the red color will be glow. The entire system is designed by using PHP programming and MYSQL. The main applications of this proposed device are safe recovery of waste from various common places with in time, avoid overflow of the dust bin and keep the environment in clean and green manner. This proposed system is implemented and executed in real time.

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