IOT Based Smart Garbage Monitoring and Alert System Using Arduino UNO

K.Harika , Muneerunnisa , V.Rajasekhar , P.Venkateswara Rao

L.J.N SreeLakshmi

B.Tech, Department of Electronics and Communication Engineering, DMS SVH College of Engineering

Machilipatnam, Krishna Dist. Andhra Pradesh, India

Assistant Professor, Department of Electronics and Communication Engineering, DMS SVH College of Engineering

Machilipatnam, Krishna Dist. Andhra Pradesh, India

ABSTRACT: Nowadays, Waste management is one of the primary problem that the world faces irrespective of the case of developed or developing country. The key issue in the waste management is that the garbagebin at public places gets overflowed well in advance before the commencement of the next cleaning process. It in turn leads to various hazards such as bad odor and ugliness to that place which may be the root cause for spread of various diseases. To avoid all such hazardous scenario and maintain public cleanliness and health this work is mounted on a smart garbage system The main theme of the work is to develop a smart alert system for garbage clearance by giving an alert signal to the municipal web server for instant cleaning of dust bin with proper verification based on level of garbage filling. This process is aided by the ultrasonic sensor which is interfaced with Arduino UNO to check the level of garbage filled in the dust bin and sends the alert to the municipal web server once if garbage is filled.

The whole process is upheld by an embedded module integrated by using GSM and GPS with IOT facilitation. The real time status of how waste collection is being done could be monitored and followed up by the municipality authority with the aid of this system. In addition to this the necessary remedial measures could be adapted. An Android application is developed and linked to a web server to intimate the alert form the microcontroller to the urban office and to perform the remote monitoring of the cleaning process, done by the workers, thereby reducing the manual process of monitoring and verification. The notifications are sent to the Android application using Wi-Fi module.

KEYWORDS: Arduino UNO R3,Ultrasonic sensor,Embedded Systems, GPS Module,GSM Module, Wi-Fi Module, and Waste management.

I.INTRODUCTION

The ultimate need to developing nation is the key for "Smart City". The influential ecological factors this may include hazardous pollution, effects on human health, alarming global warming and depletion of ozone layer etc. A proper maintenance becomes mandatory for an efficient and effective overcome of the generated in Environment. This project proposes an e-monitoring system that put forth's an embedded system and web based software assimilated with IOT technology.The filling level of the garbage bin in the dust bin and its original level height could be sensed /monitored by the ultrasonic sensor. Programming in the Arduino UNO is done in such a way that once a particular level of filling is sensed information message is sent requesting to clean and update the status of bin.

II.RELATED WORK

Arduino UNO is an open source hardware and software. The board designs use a variety of microprocessors and controllers. The microcontrollers are typically programmed using a dialect of features from the programming languages

C,C++,JAVA. Actually Arduino software is used to write the code. In Arduino the code is called as "sketch" .The program is compiled and converted to machine code (ino) using the same software. The "ino" file is dumped ATMEGA 328 using the same Arduino software.
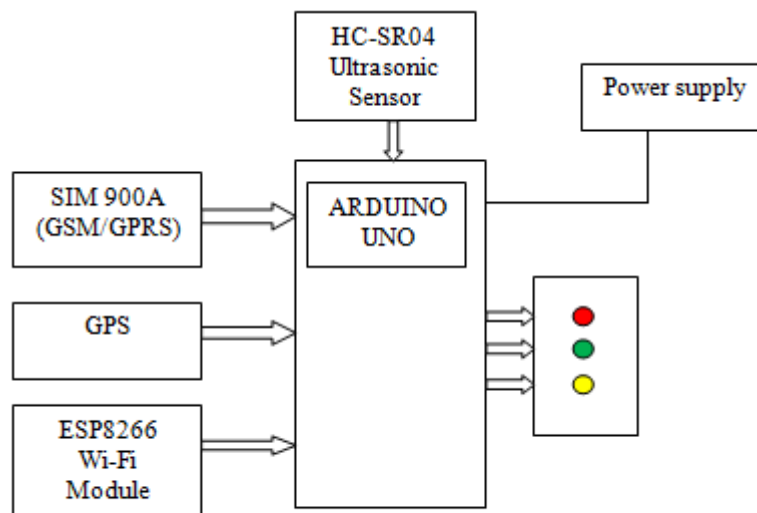
III.PROPOSED SYSTEM

A.*Block Diagram*:

Fig.1.Block diagram of the system

Arduino UNO is the main Module in this project. The Ultrasonic sensor which is interfaced with Arduino UNO to check the level of garbage filled in the dustbin. GSM/GPRS Module is used to establish communication between a user computer and a GSM-GPRS system and using this module we get the SMS notification from the trashcan.GPS Module is a navigation device it will indicates the location where garbage is filled and by using Wi-Fi Module we get unique IP-address for SMS and also Municipal Officer can see the garbage bin status in "All things talk" web site.

Three LED bulbs indicate the garbage level in trashcan. Yellow LED indicate the empty in the dustbin, Green LED represents the half of the dust bin is filled, Red LED indicate the trashcan is filled. Then immediately message is transferred to Municipal Wed Server Office.

B. *Internet of Things:*

The Internet of Things was developed by Kevin Ashton in 1999.It is a system of interrelated many computing devices, digitalmachines, objects, animals (or) people that are provided with unique identifiers and the ability to transfer data over a network without requiring human to human (or)human to computer devices. And can control these devices anywhere through internet.

Fig.2.IoT representation

C. Arduino UNO R3:

Arduino Uno is an open-source electronic prototyping platform based on flexible, easy-to-use hardware and software. "UNO" means one in Italian and is named to mark the upcoming release of Arduino 1.0And it is a microcontroller board based on the ATmega328 as shown in Fig.3 it has 14 digital input/output pins (of which 6 can be used as PWM outputs)6 analog input, a 16 MHZ crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It has 32 KB of flash memory of which 0.5KB is used by bootloaderand it contains 2KB of SRAM and 1KB of EEPROM and two 8bit Timers and one 16 bit Timers. It has onboard power supply and an USB port to communicate with PC.
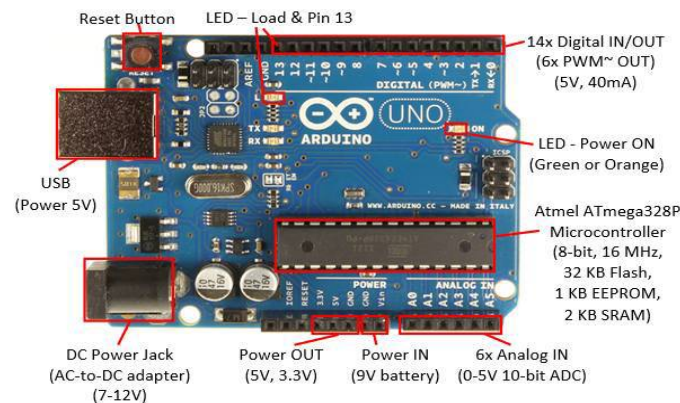

Fig.3.Arduino UNO R3

D.ated *Ultrasonic Sensor:*

Ultrasonic Sensors are devices that use electrical-mechanical energy transformation to measure distance from the sensor to the target object with high accuracy and stable reading. It works on the principle similar to radar. Ultrasonic sensor generates high frequency sound waves and evaluates the echo which is received back by the sensor. Sensor calculates the time interval between sending the signal and receiving the echo to determine the distance to an object. Does to these features they are being used in many applications like detectors, use in medicine, industry etc. We are using this ultrasonic sensor to check the garbage filled in the trashcan fig is shown below.
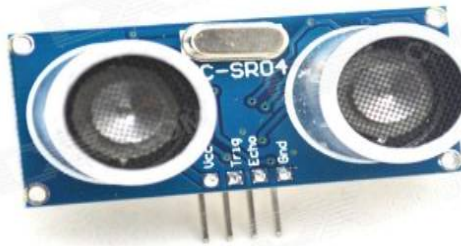
Fig.4.Ultrasonic Sensor

E. *GSM/GPRS Module:*

GSM(Global System for Mobile Communication, originally Group Special Mobile) is a standard developed by European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones. It consists of 8 pins. The specifications of GSM module are Bandwidth, Frequency, Duplex distance, Frequency band,channel separation, modulation, transmission rate etc. And due this module we get the SMS notifications from the garbage in to Municipal Officer. Whereas GPRS is an extension of GSMmodule that enables higher data transmission rate.

Fig.5.GSM module

F.*GPS Module:*

A Global Positioning System, also known as GPS .It is a navigation device that is capable of receiving information from GPS satellite along with time slots and then to calculate the device's geographical position. It consists of 4 pins. They are transmitter, receiver, ground and Vcc. Many GPS receivers have information about place. GPSs for automobiles have travel data like road maps, hotels, server stations etc. Each satellite contains an atomic clock which is carefully set by NORAD several times every say. By using this module we get the location along with time slots .So, we can easily find the garbage bin.

Fig.6.GPS module

G. Wi-Fi Module(NODE MCU ESP 8266):

Wi-Fi Module is most leading device in the IoT platform and it can communicate with any microcontroller and make the project wireless. And ESP8266 is a low-cost Wi-Fi microchip with microchip with full TCP/IP stack and microcontroller capability.It consists of ESP8266 with 1MiB of built-in flash so, allowing for single-chip devices capable of connecting to Wi-Fi.

ESP8266 Wi-Fi Module is a self contained SOC (System on Chip). This module has a powerful enough on-board processing a storage capability. And it has increased the flash disk from 512k to 1MB.It consists of 8 pins and transmitter and receiver pins are used for communication. It consists of 64 KiB of instruction RAM, 96 KiB of data RAM. Does these features it is used for unique IP address.

Fig.7.Wi-Fi module

IV.HARDWARE IMPLEMENTATION& RESULTS

Fig.9(b) shows Hardware implementation of the system. Here Arduino UNO R3 is connected to the PC by using USB cable then we get 5V Power Supply and we can upload the programs using this cable to the USB port of an Arduino. Generally a Dustbin is having three levels that are listed as follows EMPTY level, HALF FILLED levelandFILLED level are to be considered. Where an Ultrasonic Sensor is placed on the top of the Bin then it can able to measure the level of Garbage filled in the dustbin. This condition of a bin is sends message by using GSM(Global System for Mobile) module and along with GPS(Global Positioning System) coordinates. Which can gives the exact location of that particular bin to the respective Municipal Authority Office. And by using Wi-Fi Module NODE MCU ESP8266 Municipal Officer can see the dust bin status anywhere through internet using "All things talk" web site. This Hardware System is kept at the top of the bin this setup is shown in Fig. 8(a) &8(b).

For IOT based designed projects a special website is used which is termed as AllThingsTalkMaker. For getting the desired level of performance we should need to access this website. This accessing procedure must needto have three major requirements i.e., SSID Network and its password, Client ID and its password and Device ID.

Fig. 8(a) Dust bin   Fig. 8(b) Garbage Bin Setup

V. RESULTS

Fig.9 Sent Text Message to Mobile

Fig.10 Webserver Status: Empty then Bin shows **Green** Color
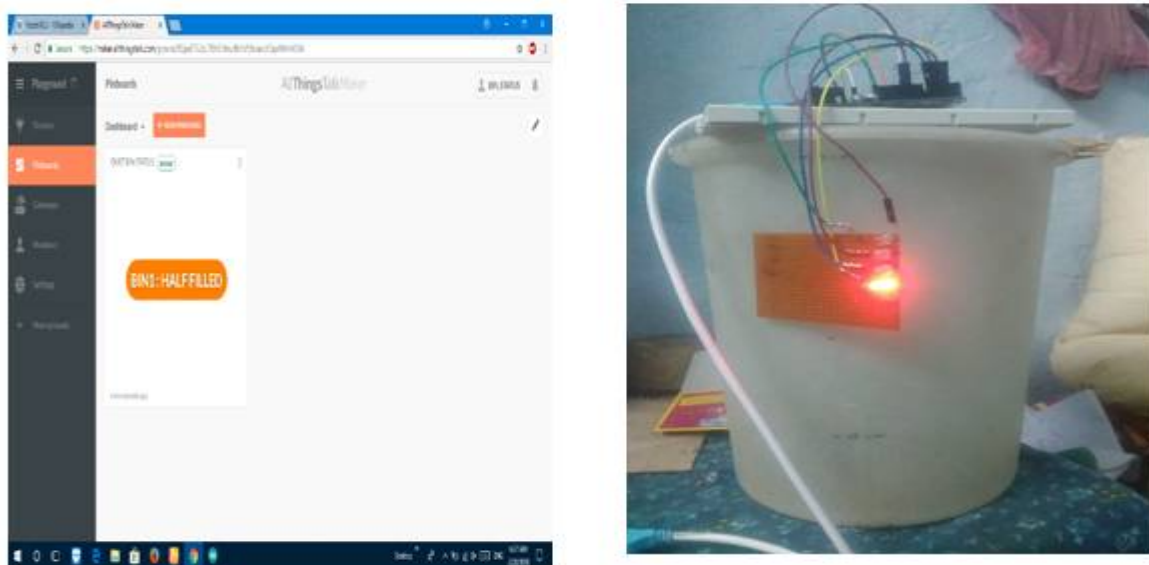
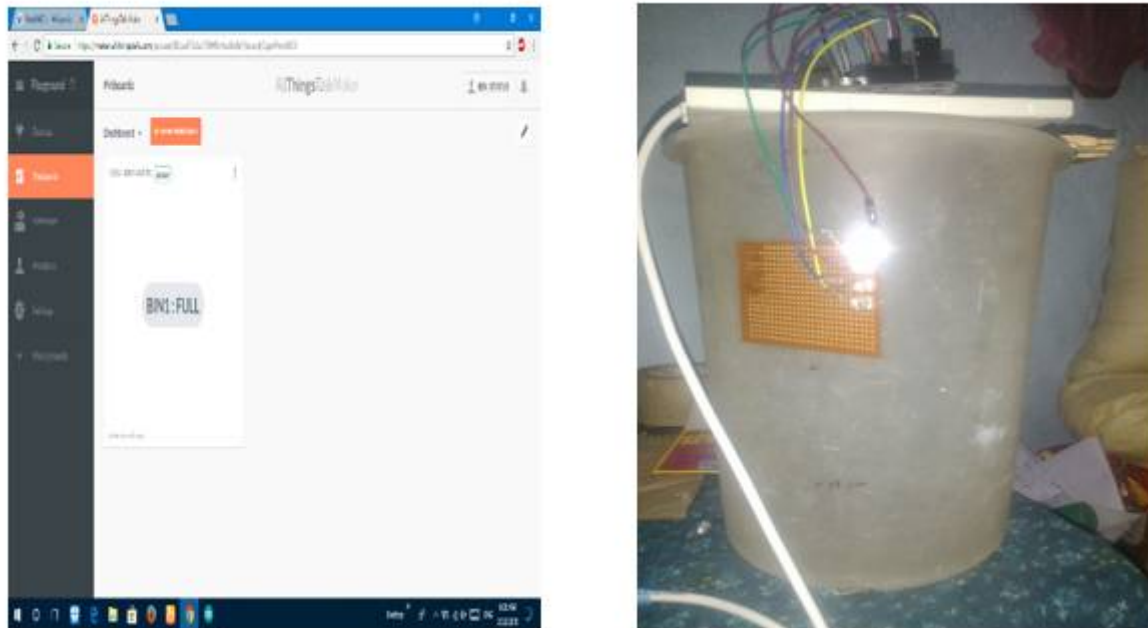**Fig.11 Webserver Status**: Halffilled then Bin shows **Orange** Color

Fig.12(a) Webserver Status: Full,Filled Bin shows **White** Color

VI.CONCLUSION

This system has been successfully designed and tested. Now this system can be implemented in full fledge for monitoring the status of bin and it will give the alert commands and to maintain public clean and green and make it as a Smart City. The designed system is very portable so as to make it easy to access, configure, run and maintain.

VII. FUTURE SCOPE

At present garbage bins are cleaned whenever the commencement of cleaning process is given to workers. We have taken initial step in making thisto consume very less time for maintaining clean environment through this paper by implementing Smart Garbage Alert System.

Further, in future this system can be implemented by controlling garbage overflow in smart way it means that it can also separates the garbage into Dry and Wet and it is Real time based cleaning our cities. Most important thing is that which helps the scheme of Swachh Bharat Mission.

REFERENCES

1. K. Tharun Kumar Reddy, P. Ajay Kumar Reddy, and P. Siva Nagendra Reddy. "An IoT Based Remote Monitoring of Landfill Sites Using Raspberry Pi2." Emerging Trends in Electrical, Communications and Information Technologies (2017): 219.
2. Ikuo Ihara. "Ultrasonic Sensing:Fundamentals and its Applications to Nondestructive Evaluation", LectureNotes Electrical Engineering, 2008.
3. Chae, M.J., Yoo , H.S., Kim, J.R., and Cho, M.Y., "Bridge Condition Monitoring System Using Wireless Network (CDMA and Zigbee)," 23rd International Symposium on Automation and Robotics in Construction ISARC 2006, Tokyo, Japan, 3 – 5 Oct 2006.
4. Arebey, Maher, et al. "Solid waste monitoring and management using RFID, GIS and GSM." Research and Development (SCOReD), 2009 IEEE Student Conference on. IEEE, 2009

5.WIRELESS DUST BIN MONITORING AND ALERT SYSTEM USING ARDUINOP.Siva Nagendra Reddy , Assistant Professor, Department of ECE, Kuppam Engineering College,Kuppam,A.P.

6. IOT based smart garbage alert system using Arduino UNON. Sathish Kumar; B. Vuayalakshmi; R. Jenifer Prarthana; A. Shankar 2016 IEEE Region 10 Conference (TENCON)

7. IoT based solid waste management system for smart cityKrishna Nirde; Prashant S. Mulay; Uttam M. Chaskar 2017 International Conference on Intelligent Computing and Control Systems(ICICCS)

8. Human safety system in drainage, unused well and garbage alertingsystem for smart cityV. S. Velladurai; M. Saravanan; R. Vigneshbabu; P. Karthikeyan; A. Dhlipkumar2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC).