GARBAGE MONITORING SYSTEM USING IOT

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Abstract:
In the present scenario, as the population is increasing day by day, the environment should be clean and hygienic. In most cities, the overflowed garbage bins create an unhygienic environment. This will further lead to the rise of different types of unnamed diseases. This will degrade the standard of living. To avoid all such situations this paper gives a clear picture of an IoT-based garbage monitoring system to keep the environment clean and safe. This project IOT-based Garbage monitoring system is a very innovative system that will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. Also, it indicates the status of toxic gas formation inside the bin as well as the weight of the bin. For this, the system uses an ultrasonic sensor placed over the bins to detect the garbage level and compare it with the level of the garbage bin's depth. The system makes use of an Advanced Virtual Reduced (AVR) Instruction Set microcontroller, Organic Light Emitting Diode (OLED) screen, Global system for mobile communication (GSM) modem for sending data and a buzzer. The system ispowered by a solar cell and battery. The Organic Light Emitting Diode (OLED) screen is used to display the status of the level of the garbage collected in the bins, whereas 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. The display shows the condition of the trash stage and the other feeler information. The system puts on the buzzer when the level of garbage composed crosses the set limit or if there is the occurrence of toxic gases. Thus, this scheme helps to maintain the city'ssparkle by informing about the trash levels of the bins by providing a graphical representation of the bins via a web page.The display shows the condition of the trash stage and the other feeler information. The system puts on the buzzer when the level of garbage composed crosses the set limit or if there is the occurrence of toxic gases.

KEYWORDS: IoT garbage monitoring system, Toxic gas formation, Advanced Virtual Reduced (AVR) Instruction Set Micro Controller, Organic Light Emitted (OLED) Screen.

I. INTRODUCTION

For the realization of the topic of research, relevant information in the international scientific arena was collected through studies of the diverse literature from textbooks/literature, international scientific journals, and environmental progress report from different agencies, internet websites, reports by governmental agencies, substantial knowledge was gathered and a review of what other scientist have written on issues concurring with the research topic was made. A literature review was then undertaken to gather information on the research in the field of the impact of urban waste on the quality of groundwater and soil in different areas. The characteristics and composition of the urban waste i.e. sewage and municipal solid waste was studied by various workers in the world. Literature shows evidence of the work carried

out on the health risk assessment due to urban waste. The impact of urbanization on water quality as well as soil quality was also studied by various researchers in different parts of the world. Atthe International level, there are various organizations including private and government which are working in the field of environment and are engaged in research and development in the field of waste management. International agencies like World Health Organization (WHO), Environmental Protection Agency (EPA), and United Nations Environment Program (UNEP) are engaged in developing new technologies for waste management and its disposal including its characterization. A clear idea about the literature review at the national and international levels is given below. Management of Municipal Solid Waste for various cities and towns has been widely studied throughout the world. As the huge quantities of solid waste generated in the urban areas is a major problem, the majority of researchers concentrated on this issue. Numbers of researchers have tried to find out new techniques for solid waste management. Mahar reported the review and analysis of the solid waste management situation in urban areas of Pakistan. According to him, poor solid waste management is one of the major causes of environmental degradation in Pakistan. According to Rajput et.al., municipal firm squanders production displayed divergent fashion and a beneficial parallel with monetary development in the expression of kg/capita/day firm waste production at humanity weighing machine. Yadav and Deviconducted studies on solid waste management in Mysore city. ShivaYoginath standard out a look into on Neighbourhood firm ravage supervision in Raichur city. They methodically deliberate all the mechanisms of metropolitan rock-hard squander administration and also optional technical administration. Agarwal et.investigated recycling of unrestricted firm waste (MSW) in the Indian capital city of Delhi.

II.BLOCK DIAGRAM OF PROPOSED SYSTEM

The IoT garbage monitoring system is built on the Arduino board platform and IOT gecko web development platform as shown in figure.8. It is interfaced with a Wi-Fi modem and compost is fortified with an ultrasonic sensor. The hardware such as AVR family microcontroller, LED's, LCD, 12V transformer, Resistors, Capacitors, and Diodes. The software provisions are Arduino compiler, IOT Gecko, and MC Programming Language C.

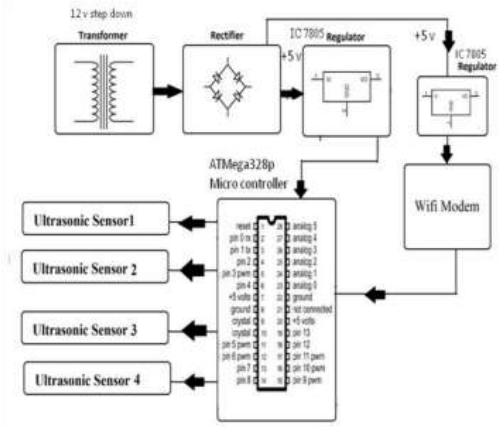

Fig 1: Block diagram

The block diagram includes a transformer, rectifier, regulators, Wi-Fi Modem, AVR microcontroller, and Ultrasonic sensors. The Ultrasonic sensors are placed over the garbage bins to detect the level of the garbage collected in the bins and are interfaced with the Ultrasonic sensors. The Wi-Fi modem also interfaced with the microcontroller. The supply (230V 50 Hz ac) is given to the stepdown transformer it stepdown 230V into 12V ac and its output is given to the rectifier. The rectifier converts alternating current into direct current (AC to DC). The rectifier output is given to both of the regulators. The purpose of the regulator is

to maintain the output voltage constant. One of the regulators'outputs is directly given to the microcontroller and the regulator output is given to the microcontroller through a Wi-Fi modem. That depicts the Block Diagram.

III. HARDWARE USED

1.NodeMCU:

Fig 2 : NodeMCU

Today, IoT applications are on the rise, and connecting objects is getting more and more important. There are several ways to connect objects such as Wi-Fi protocol.

NodeMCU is an open-source platform based on ESP8266 which canconnectobjects and let data transfer using the Wi-Fi protocol. In addition, by providing some of the most important features of microcontrollers such as GPIO, PWM, ADC, etc, it can solve many of the project's needs alone.

2.ARDUINO UNO

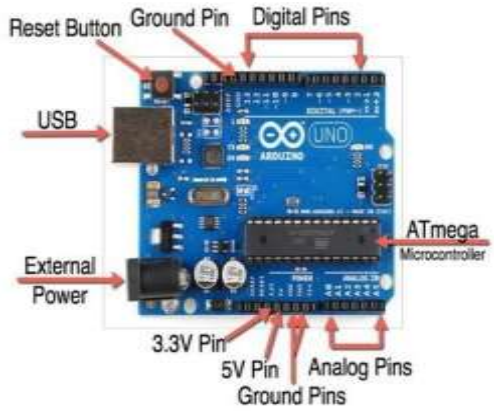

Fig 3: ARDUINO Uno Board.

ARDUINO is an open-source platform used for building electronics projects. ARDUINO consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

3. ULTRASONIC SENSOR:

Fig 4: Ultrasonic sensor

Ultrasonic sensors are electronic devices that calculate the target's distance by emission of ultrasonic sound waves and convert those waves into electrical signals. The speed of emitted ultrasonic waves traveling speed is faster than the audible sound.

There are mainly two essential elements which are the transmitter and receiver. Using the piezoelectric crystals, the transmitter generates sound, and from there it travels to the target and gets back to the receiver component.

4. GSM MODULES.

GSM/GPRS module is used to establish communication between a computer and a GSM GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables a higher data transmission rate. Global system mobile communication is the part which Is used to get the information or display the

information n the screen by mobile communication. This component is used mostly in all the projects where wireless communication has to be done.

Fig 5: GSM/GPRS Modem

GSM modem is used to send messages to the garbage depots if the Garbage Can exceeds the set threshold level. With the help of the GSM module interfaced, we can send short text messages to the required municipal office. GSM module is provided by Sim using the mobile service provider and sends SMS to the respective authorities as per programmed. It operates at either the 900 MHz or 1800 MHz frequency band.

5. WI-FI MODULE:

ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Express if system. It is mostly used for the development of the Internet of Things (IoT) embedded applications. The ESP8266 is a low-cost Wi-Fi microchip with a full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturing company Express if Systems. The ESP8266 is capable of either hosting an application or offloading all the Wi-Fi networking functions from another application processor. Each ESP8266 Wi-Fi module comes pre-programmed with an AT command set firmware, now you can simply hook this up to your Arduino device and get as much Wi-Fi ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost-effective board with a huge, and fastest-ever-growing, community.

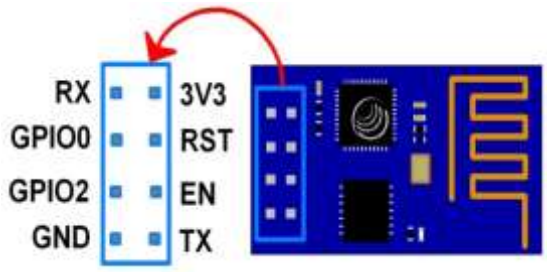

Fig 6:ESP8266 Wi-Fi Module Pinout

6. LCD DISPLAY:

LCD (liquid crystal display) is the technology used for display in a notebook and other smaller computers like a light-Emitting diode (LED) and gas-plasma technologies.

Nowadays, we always use devices that are made up of LCDs such as CD players, DVD players, digital watches, computers, etc. These are commonly used in the screen industries to replace the utilization of CRTs. Cathode Ray Tubes use huge power when compared with LCDs, and CRTs are heavier as well as bigger. These devices are thinner as well power consumption is extremely less. TheLCD16×2workingprincipleis, that it blocks the light rather than dissipates it. This article discusses an overview of LCD 16X2, pin configuration, and its working.

A liquid crystal display is used to display the information on the screen. It contains 16bits and with two rows. Each row consists of 8bits. It includes a parallel interface which means that the microcontroller used in this has to control different interface pins immediately to control the LCD.

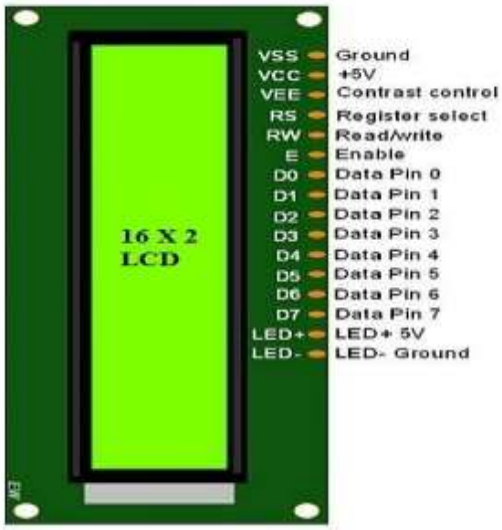

Fig 7: LCD-16×2-pin-diagram

IV. WORKING PROCEDURE

The IoT Garbage Monitoring system is a very innovative system that will help to keep the cities clean. This arrangement monitors the garbage bins and notifies them about the level of garbage collected in the garbage bins via a web page. For this, the scheme uses ultrasonic sensors positioned over the bins to detect the garbage level and relate it with the garbage bin's depth. The system makes use of the ARDUINO family microcontroller, LCD screen, Wi-Fi modem for sending data, and a buzzer. The scheme is powered by a 12V transformer. The LCD screen is used to display the status of the level of garbage composed in the bins. Whereas 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 climaxes the garbage collected in colorto show the level of garbage collected. The LCD monitor shows the condition of the trash level. The scheme puts on the signal when the level of trash composed crosses the customary limit. Thus, this scheme aids to remain the city spotless by updating the trash levels of the bins by providing a graphical representation of the bins via a web page. The ESP8266 Wi-Fi Module is a self-contained SOC with a combined TCP/IP decorum stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is talented at either hosting the submission or unburdening all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command customary firmware. The ESP8266 module is an extremely price-effective board with an enormous, and ever- increasing, community.

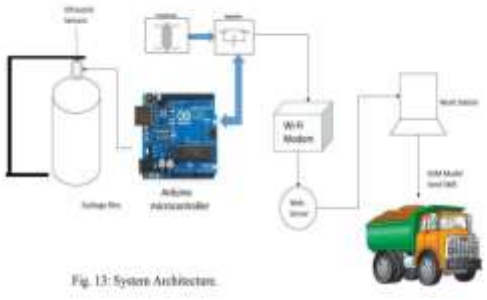

Fig 8: System Architecture

The following are the results obtained from this work. • Waste level detection inside the dustbin. • Transmit the information wirelessly to the concern. • The data can be accessed at any time and from anywhere. • The real-time data transmission and access. • Avoids the overflow of the dustbin. This IoT beached waste management is very useful for smart cities in diverse aspects. We have seen that in cities there are dissimilar dustbins located in different areas and dustbins become overflown many times and the concerned people do not get info about this. Our system is designed to crack this issue and will offer complete details of the dustbins located in different areas throughout the city. The allocated authority can access the information from anywhere and anytime to get the details.Accordingly, they can revenue a decision on this immediately. Fig. 6 depicts the garbage view of the garbage levels.There

are four pins in the figure transmitter, Receiver, Trigger, and Echo. These are the four pins connected in the circuit diagram.The basic idea of this project is to design a smart Garbage detection system that would automatically notify the officials about the current status of various garbage bins in the city, with real-monitoring capabilities, and a remote-controlled technique, which is depicted .time-consuming high costs, Greater traffic, and congestion, Unnecessary fuel consumption, increased noise, and air pollution as a result of more trucks on the road. All the above disadvantages are a result of a lack of real-time information resulting from any successful collection of waste.

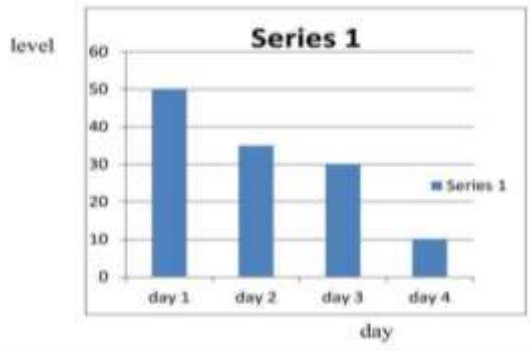

Fig.9:Graphical view of the Garbage level.

V. CONCLUSION

The IoT-Garbage monitoring system pays a lot towardthe clean and disinfected pollution-less environment in building a smart city. As this technology is new in India there should be appropriate consciousness and alertness among the public before the operation of this technology. Otherwise, sensitive devices like sensors might be spoiled due to the rough action of the users. It is an automatic dust bin monitoring system to sense the full condition of the garbage bins. This provides the authorized users with appropriate updateson the location of the garbage bins and thus eliminates the need for intermittent manual checks and overflowing garbage bins. This method finally helps in keeping the environment clean. Thus, the garbage collection is made more efficient, effective, and operative.

VI. FUTURE SCOPE

In the future, this project can be used to protect our environment without spreading the dust from the garbage bins. Implementation is done only for a single bin. Integration of many bins each with a unique id can be done by implementing principles of IoT.

VII.REFERENCE

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