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GARBAGE MONITORING SYSTEM USING INTERNET OF THINGS (IOT) AND GSM

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Abstract - *The spill over of garbage in civic areas generates pollution and leads to vulnerable diseases. Smart Garbage Monitoring System using GSM and IOT proposes to eliminate and reduce the garbage on Roads, Cities, States and the entire country. Our country requires a "Smart Garbage Monitoring System" for completely eradicating these types of waste which develop communicable and vulnerable diseases. The motive of our project is to ensure that all citizens need to keep their surroundings, streets, areas clean and healthy. Our Smart Garbage Monitoring System will check level of waste on dustbins and using sensor and after detecting of the dustbin status it will report to the concerned authority this ensures for a green environment and also supports Swachh Bharath campaign.*

***Key Words*: Smart Garbage, GSM, Internet of things (IOT), DC motor, LED, LCD, IR sensor, Ultrasonic sensor.**

1. INTRODUCTION

The efficient management of waste has a significant impact on the quality of life of citizens. A Smart City means an upgraded city with developed technologies that people use in day to day life. The detection, monitoring and management of waste is one of the primary problems of the present era. The word smart doesn't mean only smart garbage it is the updated technology that we use in 2019.Like we switch to the updates in phone, lifestyle etc.it is now important to update our locality by keeping it clean. The cleaner the area is, it tells about the discipline of the people in that area. Let's imagine a scenario of we driving a bike and when we come across overflowing garbage that stinks what we all will do? We will close our nose and blame others. We won't realize we will do the same on our street garbage bin also.

Fig -1: Garbage spillover.

1.1 EXISTING SYSTEM

There is no wireless technology available for monitoring dustbins. As a given population increases, the amount of trash generated also increases. Even if a given population were to remain constant in number, the amount of trash generated by that population continues to increase. Thus, it has become necessary to develop techniques and equipment that can process and dispose of greater and greater amounts of trash.

Disadvantages

- Difficult to find the dustbin is full or not remotely.

1.2 PROPOSED SYSTEM

The dustbin is monitored continuously in real time and the status of the dustbin is updated. The person who is in-charge nearby will receive a message to remove the waste from that particular place and empty the bin again. Using the data we can optimize wastage collection routes and reduce fuel consumption. It allows trash collectors to plan their daily, weekly schedules.

Advantages

- Fast response
- Person nearby is detected.
- One-time installation.

Fig -2: Motive of this project.

2. LITERATURE SURVEY

2.1.IOT Based Solid Waste Management System -A conceptual approach with an architectural solution as a smart city application *Abhay Shankar Bharadwaj, Rainer Rego, Anirban Chowdhury* Frugal Labs Tech Solutions Private Limited, Bengaluru, Karnataka*, India Overall system architecture and protocol stack to give an IoT based solution to improve the reliability and efficiency of the system.

2.2. A Waste City Management System for Smart Cities Applications -*Dung D. Vu, & Georges Kaddoum Electrical Engineering Department École de Technology Supérieure Montréal, Canada.* In this approach, the sensor model detects, measures, and transmits waste volume data over the Internet. The collected data including trash bins geo-location and the serial number is processed by using regression, classification and graph theory.

2.3. Cloud Computing Based Smart Garbage Monitoring System - *Jetendra Joshi, Joshitha Reddy, Praneeth Reddy, Akshay Agarwal, Rahul Agarwal, Amrit Bagga, and Abhinandan Bhargava Department of Computer Science, NIIT University, Rajasthan, India*

In this paper they have presented a solution about the Smart Bin is a network of dustbins which integrates the idea of IoT with Wireless Sensor Networks. They have also put forward the concept of a network of smart garbage bins based on the Stack Based Front End approach of integrating Wireless Sensor Network with the Cloud computing and discuss how Machine Learning techniques like Decision Forest Regression can be applied to the sensor data leveraged by the system to gain useful insights to improve the efficiency of the garbage monitoring.

2.4. Smart Garbage Monitoring and Clearance System using Internet of Things *–S. Vinoth Kumar1, T. Senthil Kumaran2, A. Krishna Kumar3 and Mahantesh Mathapati4*.

This paper is proposed IOT based smart waste clean management system which checks the waste level over the dustbins by using Sensor systems. Once it detected immediately this system altered to concern authorized through GSM/GPRS. For this system used Microcontroller as an interface between the sensor system and GSM/GPRS system. To monitor and integrate an android application is developed for the desired information which is related to the various level of waste in different locations. This is ensued the greenish in the environment and support for Swachh Bharath for cleanness.

3. WORKING PRINCIPLE

In proposed system, ultrasonic sensor is used to monitor the level of garbage level.IR sensor is used to monitor the nearby persons and automatically drivers the DC motor to open the lid of the dust bin.

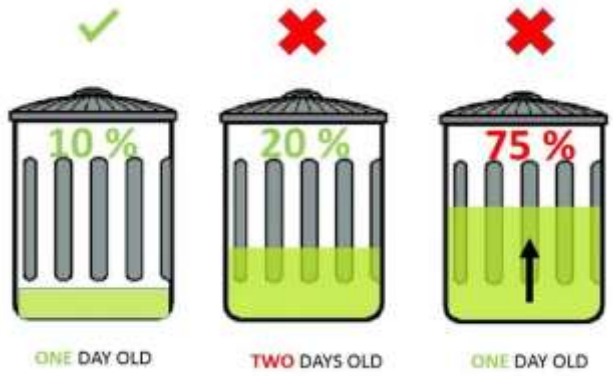

Fig -3: Picture showing the percentage of garbage.

The dustbin data are uploaded to the cloud using IOT. Using GSM, the information about the garbage level is sent to the person whose number is been linked with that GSM module. These helps for clearing the wastage from dustbin.

4. BLOCK DIAGRAM

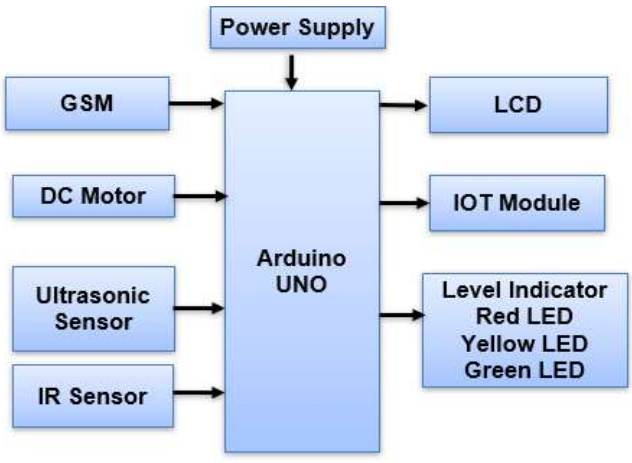

Fig -4: Block diagram of smart garbage monitoring system.

5. FLOW CHART

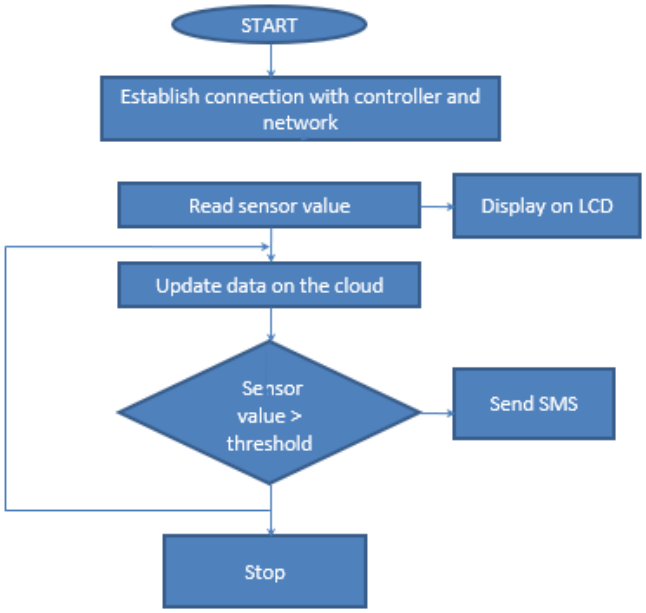

Fig -5: Flow chart of smart garbage monitoring system.

6. ARDUINO UNO WITH ATmega328P

Arduino is the interface between sensors, systems and IOT systems. Arduino senses the environment by receiving input from many sensors and affects its surrounding by controlling lights, motors and actuators. We can tell our board what to do by sending a set of instructions to the microcontroller on the board. We use an Arduino programming language and the Arduino software IDE. It contains a 14-digital input/output pins,6 analog input pins, a 16MHZ quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. We can power it simply by connecting with a battery to get started. ATmega328 is a single chip microcontroller which belongs to mega AVR series. Talking about features the ATmega 8-bit RISC microcontroller combines32KB flash memory with read/write capability SROM &EPROM and 23 general purpose I/O line, 32 general purpose registers, SPI serial ports, 6 ADC converters and 3 flexible timers, counters internal and external interrupts byte oriented serial interface.

Fig -6: Arduino Uno ATmega328 board.

6.1. LIQUID CRYSTAL DISPLAY(LCD)

The status of the garbage level measured by the ultrasonic sensor is displayed in the LCD and it gets updated after every value measured by the ultrasonic sensor.by seeing this LCD we can decide which garbage din to use and it is very helpful in checking whether the bin is empty or full. LCD standard requires 3 control lines and 8 I/O lines for the data bus. The 8 data lines are connected to PORT 1 of 8051 microcontroller. The three control lines (RS, RW and EN) are connected to PORT 3.5,3.6 and 3.7 respectively.

RS: Register Select

RS = 0 -> Command Register is selected

RS = 1 -> Data Register is selected

R/W: Read or Write

0 -> Write, 1 -> Read

E: Enable (Latch data)

8 data pins D7:D0 -- Bi-directional data/command pins.

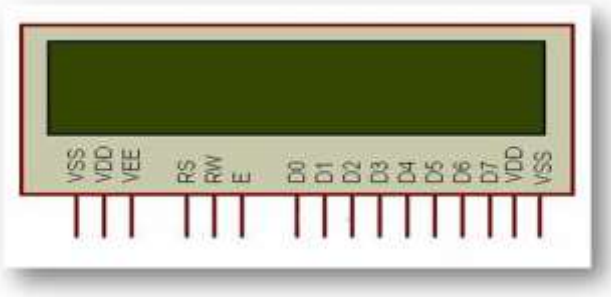

Fig -7: LCD display.

Fig -8: LCD shows the level of garbage.

6.2. ULTRASONIC SENSOR

This sensor helps in detecting the level of garbage that is present inside the bin and it gives the value which is updated every 15 seconds to the cloud and the status is displayed in the LCD. This sensor is useful for monitoring the bin and convenient for the users to determine whether the bin is full

or not. It has 4 pins Ground, VCC, Trigger, Echo. Trigger and Echo is connected to 5th and 6th I/p, o/p pin in the Arduino Ultrasonic sensors work on a principle similar to sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. ultrasonic sensor can measure the distance from 2cm to 4mm.

Fig -9: Ultrasonic sensor.

The working principle of the sensor is it emits ultrasound at 40,000HZ which travels through air and if there is any object or obstacle which is been detected on the path it. Bounces back to the sensor it records the travel time speed of sound by which we can calculate the distance. Simply the transmitter sends a high frequency signal when it finds an object it is reflected and transmitter receives it. These are not affected by sunlight or any materials this kind of principle is used by bat.

6.3. IR SENSORS

Fig -10: IR sensor.

IR sensors are used to detect the presence of an obstacle or a person's motion or heat emitted by them. It is interfaced with the DC motor so that if IR sensors detects any person, the lid of the bin opens for people to drop the garbage. These radiations are not visible to naked eye IR sensors detect the heat and motion of an object or person. Thermal radiations are detected by passive IR sensors. The resistances and the output voltages, change in proportion to the magnitude of the IR light received.

6.4. L IGHT EMITTING DIODE (LED)

We use three color led red, orange and yellow. Yellow indicates that the garbage is low, orange led indicates that the garbage is medium and red indicates that the garbage is full. When voltage is applied to leads, electrons are able to recombine with holes w device, releasing energy in the form of photons. This effect is called as electro luminescence, and color of the light is determined by the energy band gap of the semiconductor. LED's are small in size and consume little power. The two terminals anode and cathode of a LED when connected to a voltage source in the correct polarity, may produce lights of different colors.

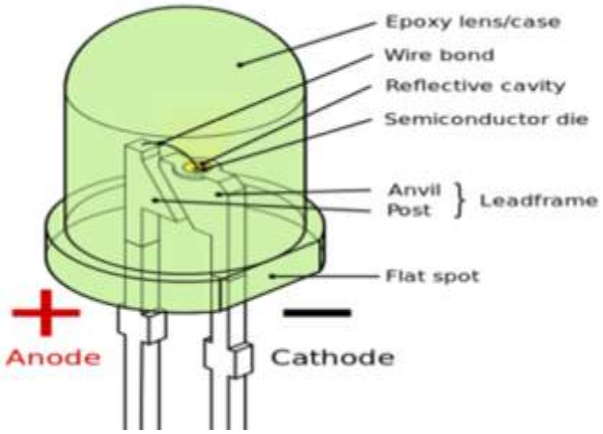

Fig -11: LED light.

6.5. GSM (Global System for Mobiles)

Fig -12: GSM Board.

GSM sends the status of the garbage bin to the truck collector who is being allotted to that area and after receiving the message he will come and collect the garbage from his area. This will prevent the spillover of garbage and will make the surroundings clean. GSM operates in a different carrier

frequency range. The GSM ranges from 900MHZ to 2-8GHZ and we use 4G sim for transformation of messages so it is uses 2-8GHZ frequency range.

6.6. DC MOTOR

Fig -13: DC Motor.

We use a 12V DC motor for opening and closing of the lid of the bin automatically. IR sensor is interfaced with this motor so that it senses the motion or heat waves of a person and understands to open the lid so it initiates the motor to open the lid. The motor is paired with an encoder to provide position and speed feedback. In the simple case, only position is measured. The position of the output is compared to the command position. If the output position differs from required, an error signal is generated which causes the motor to rotate in either direction. When position approaches, the error signal reduces to zero and motor will stop. A DC motor is closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is some signal, may be either analog or digital, depending on the position commanded for the output shaft.

7. INTERNET OF THINGS (IOT)

The data's that are received from the IR sensors, Ultrasonic sensors are being stored in the cloud using IOT module and it keeps an updated copy of those sensor values every now and then using those values we can easily find the status of the dustbin. IOT is a concept of connecting many devices to the internet. It is a huge network of devices and people. All data's are being collected and shared. Some of the well-known application of IOT are smart watches, self-driving cars, smart microwaves etc. Devices and objects have inbuilt sensors in them that are connected to the internet of things platform which collects different data's from different devices and do analysis and will share the most useful information with applications that are needed to the users or public.

8. ARDUINO IDE

We use the Arduino IDE application tool for uploading our program and which is externally interfaced using cables with the Arduino modules and then the program is been sent to the module from the Arduino application.

Fig -14: Truck receiving message from various bins in a particular area.

9. EMBEDDED C

We have developed our codes for the Smart Garbage Monitoring in the language "Embedded C". It is a standard and user-friendly platform that exists. Embedded C is an extended language of C.

10. FUTURE SCOPE

There is need of new mechanism to properly dispose the waste. We need an upgrade from composite pits, pit holes, burning the garbage, and tri color dustbins. In our project, we have developed an efficient waste management system. This Technology will be used to provide better garbage disposal methods in urban areas. We have used sensors to indicate if the bins are filled or empty. When filled, a truck driver receives a message to empty the bin. This system is eliminating the current day status about the bins which are lying in a most pathetic situation like garbage left over stinking in streets, near hospitals, government office and near schools. We have also developed GSM messaging system through which the municipal authorities also get information about the bins in their area. This project aims on maintaining green environment. This model is providing lot opportunity of improvement and future development.

Fig-15: Garbage spillover in front of public health department.

11. RESULT

FIG -16: Some pictures from our project.

12. CONCLUSION

Waste management is a major challenging one, if it is not properly disposed or cleaned, it will cause lot of diseases and spoil the green environment. An embedded based intelligent alert system is devised for the proper monitoring and maintenance of the garbage. This system averts the irregular cleaning of the dustbins by sending alerts to the concerned individual at regular intervals. It further improves the system by additionally endorsing the status of cleaning in real time and measure the performance of the team. This system comes in handy as an admirable solution in environmental maintenance. Addition to this it also aids to diminish the need for high human intervention in garbage maintenance of the municipality and pollution monitoring system.

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