

Smart Garbage Management System

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Abstract—Waste generation is rising at an exponential rate due to rising population and has become a major problem. Implementation of various schemes and plans to collect waste is there but proper coordination and management is somehow missing. The eradication of garbage and maintenance of cleanliness requires a smart management system that monitors dustbins deployed at public places. This IOT based project involves the interfacing of bin with Arduino and installation of ultrasonic sensor and LCD display to let the lid open automatically if someone approaches the bin. Also the notification of overloading will be sent to the authority automatically. The LCD display deployed over the bin will help to convey the filled level of the container. The main aim of this is to reduce manual efforts with the implementation of smart IOT system.

Keywords—*Internet of Things, smart appliances, Arduino.*

I. INTRODUCTION

Iot or internet of things refers to the system in which we can connect physical objects with each other for communicating and data exchange among themselves. Iot has many applications which can be used in kitchen, conveyances and home appliances. The scope of Iot has tremendously increase in the recent years. Nowadays in our society waste generation is rising in an exponential rates and it creates major threat to the living creatures. Lot of effort and time is required for the management of waste. We always noticed the dustbins are open and waste coming out of them. It creates a polluted environment and unhygienic. The purpose served by this paper is immediate cleaning of surroundings.

Waste collected has many problems including (1.) How to schedule collection of garbage. (2.) Which include route selection? Garbage collected is benefit by this. They can make their schedule of collection. In today's world all the cities are converting themselves to a better condition (smart cities).In the system multiple dustbins will be setup and should be cheap. It suggests some embedded devices which will help in getting information about the level of bins, Driver or collector will have an android application which tells him about the conditions of bins and level of bins. So he must be able to collect bins which are filled on time. All the major issues can be cured by this method.

II. LITERATURE REVIEW

A Garbage management system, dubbed to be as smart, since it is based on an Arduino Uno board, interfaced with an ultrasonic sensor and a GSM module, thus being IoT ready. The system comprises of a sensor placed inside the top of bin, with a threshold level set as 10 cm, to alert the concerned authorities if the garbage level reaches the threshold. The system is configured as to report until the bin is emptied. Such a system can contribute hugely towards a hygienic and clean environment during the building of smart cities, and the affordability, maintainability and durability of such a system were addressed in the later sections of the paper.

Further improvements to this system are suggested to create local networks of such small bins, among other suggestions. The local network being mentioned here proposes to maintain a network of connected smart garbage management systems, with each unit being an improved conventional RFID based system. The author(s) further propose the concept of weight measurement, owing to one of the motivations behind this particular system being increasing food wastages. The idea behind accumulating weight measurement is to penalize high food wasters and to measure similar trends in wastages. Weight measurement approach suggested can also be applied to improve the earlier system proposed for the particular application of food waste management.[1,2].

A method for garbage management was suggested by researchers, which is as follows. IR wireless system and a microcontroller based brain for the system have been suggested, with such systems being connected to a central server rather than having a one with one interactions. The bins would generate status reports which would be uploaded onto a central webserver, and can be seen conveniently in HTML format. To reduce costs, on the server side only a Wi-Fi module was used to send and receive the data, while on the bin side only weight based sensors were used. Thus the level of waste was not measurable.[3]

Another method of collection of garbage from a network of smart bins explained above is there. In this system, a GSM module was used for communication, and the smart bins would send raw data about the level of garbage in them to a central server. A MATLAB based GUI was created to check the garbage data from various locations. The system as a whole comprised on two functional units, a master system and a slave

system. The sensors check the level of garbage, send the raw data to slave units which pass it onto master unit, and this master unit informs authorities about the status of the bin.[4]

An approach suggested a Decision Support System for the garbage collection for the cities. This system proposes methods to handle improper waste collection in areas deemed to be inaccessible on a timely basis for waste collection. This system comprised of two parts: The first involved companies related to current systems of collection and transportation of waste throughout the city, who could also arrange some more drivers and vehicles to pass on the dumps to collection areas. The second part comprised of handling all the intermediate communications between the concerned authorities regarding this collection and transportation of wastes. Cameras were placed in those parts of city which posed the most problems and bins were placed with embedded low cost device for keeping a check on garbage levels in them. The bins were assigned UUIDs and RF Transmitters and receivers were used for communications between bin and central server.[5,6]

The notification system could be further improved and the communications with real time data transfer could be achieved by a newer approach suggested. The author suggests use of BLYNK app, on the android platform, the configuration of which involves adding a small glue code to the Arduino Uno boards used in the bins. The improvements that can be achieved are easy communication, if a workflow for real time notifications regarding garbage levels in bins can be shared with collection and transportation authorities can be setup.[7]

III. PROPOSED SYSTEM

The proposed system smart garbage system is IOT based garbage monitoring system. This system monitors garbage bins and also indicates the level of garbage collected in garbage bins. For the sensor network of this system a single hop network with a flat architecture is chosen. For the proposed system the hardware used are ESP8266.01 WIFI module ,hc-sr04, Arduino nano, DS3132 real time clock etc. the step up and down converters are used to provide power ultrasonic sensor is used to find the status of the bin with the measure of echo back distance through wireless communication. The collective aim of the project is to assist Municipal Corporation and garbage collector contractor and garbage collector contractors to efficiently monitor and collect solid waste from garbage bins in their region using IOT. The proposed system is implemented by considering some phase such as design of hardware prototype to indicate level of garbage in garbage bins, development of software and hardware module at central cloud server, development of mobile application to the current location and status of garbage bins on regional area map and generation and display of dynamic shortage path from garbage collector truck to fully filled garbage bins. Smart garbage system is a step in the direction of bringing about a change in the current garbage disposal system, sensor for level and weight detection are used.

The system can be implemented in various situations that require high manual labor or pose serious health risks. The collective aim of the project is to assist municipal corporation and garbage collector contractor to efficiently monitor and collect solid waste from garbage bins in their region. It will serve as a dynamic service, which shows the status of each garbage bin and an optimized route to each fully filled garbage bin. The advantage of the proposed system is that it has minimum human intervention. It will lead to a clean and green environment. It will have a reduction in fuel consumption of garbage collecting vans as they are already notified about dustbins ready to be collected. This, all with a safe disposal of hazardous waste.

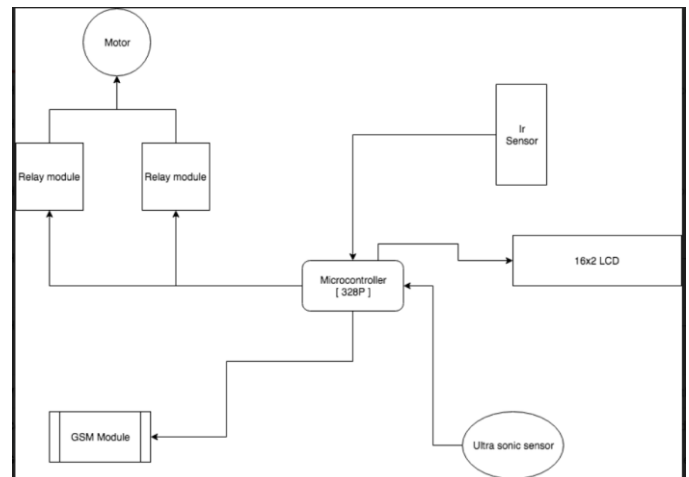


Figure 1. Block diagram

IV. MATERIALS AND METHODOLOGY

A. Arduino Uno



Figure 2. Arduino Uno Board

Arduino Uno is a microcontroller board which is based on the ATmega328. It consists of 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as

analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. It contains everything that is needed to support the microcontroller; simply connect it to a computer (or appropriate wall power adapter) with a USB cable or power it with a AC-to-DC adapter to get started.

B. Ultrasonic Sensor

An Ultrasonic sensor is a device that is used to measure the distance to an object by using sound waves. It measures distance by sending out a unique sound wave at a specific frequency and listening to the sound wave bounce back precisely. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, the distance between the sonar sensor and the object can be calculated.

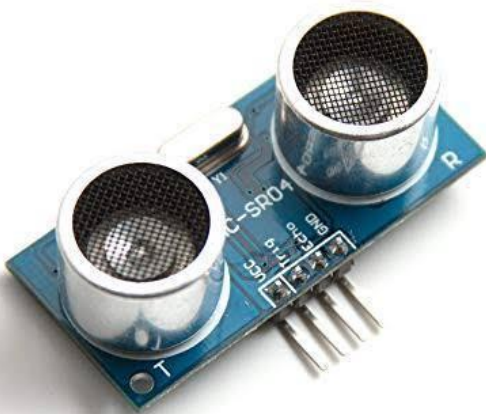


Figure 3. Ultrasonic Sensor

C. IR Sensor

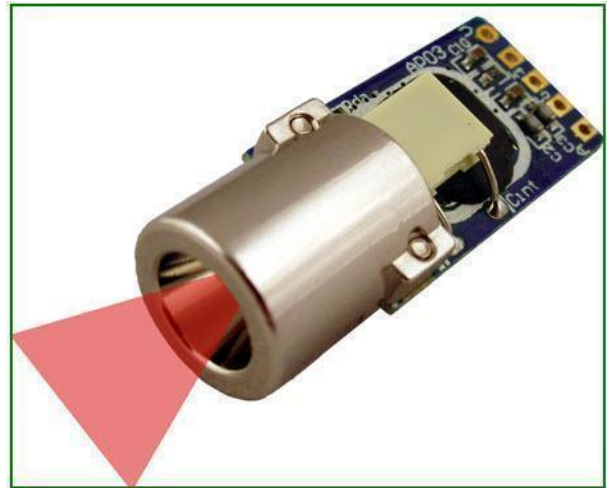


Figure 4. Infrared Sensor

Infrared sensor is an electronic device which emits in order to sense some aspects of the surroundings. An IR sensor measures both the heat of an object as well as the motion. The types of sensors that measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. In the infrared spectrum, all the objects mostly radiate some form of thermal radiations. The types of radiations which are invisible to our eyes, can be detected by an infrared sensor. The emitter is an IR LED (Light Emitting Diode) and the detector is an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, these resistances and output voltages tend to change in proportion to the magnitude of the IR light received.

D. LCD Display

A liquid crystal display or LCD is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays use super-thin technology display screens that are generally used in laptop computer screen, TVs, cell phones and portable video games. LCD's technologies allow displays to be much thinner and applicable when compared to cathode ray tube (CRT) technology.

Liquid crystal display is composed of various layers which include mainly two polarized panel filters and electrodes. LCD technology is used for displaying the image in notebook or many other significant electronic devices. Light is projected directly from a lens on a layer of liquid crystal. This unique combination of coloured light with the grayscale image of the crystal (formed as electric current flows through the crystal) forms the coloured image. This is the final image displayed on the screen.

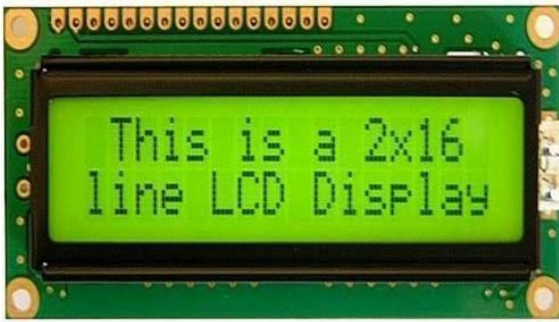


Figure 5. LCD Display



Figure 7. GSM Module

D. Breadboard and jumper wires

A breadboard is a solderless device which is used for temporary prototype with electronics and testing of circuit designs. Most of the electronic components in electronic circuits can be interconnected by inserting their leads or terminals into their respective holes and then making connections through wires in an appropriate way. The breadboard consists of metal strips underneath the board and connected holes on the top of the board. The metal strips are laid out as shown. The top and the bottom rows of holes are connected horizontally and split in the middle while the remaining holes are connected vertically.

Jumper wires are electric wires which have connector pins at each end used to connect two points to each other without soldering. Jumper wires are used mostly with breadboards and other prototyping tools in order to make it easy to change a circuit as required.

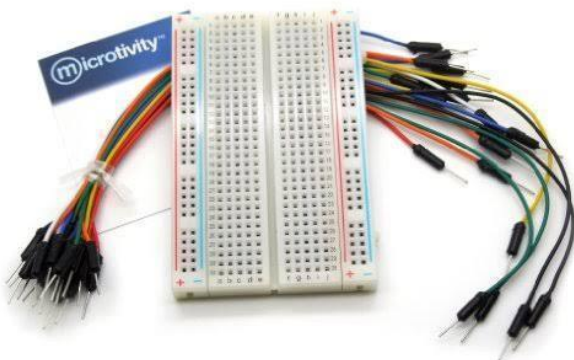


Figure 6. Breadboard and jumper cables

E. GSM Module

GSM stands for global system for mobile communication (GSM). It is a mobile communication modem. The innovative idea of GSM was developed at Bell Laboratories in 1970. GSM is widely and successfully used in mobile communication system in the world. It is an open and digital cellular technology which is used for transmitting mobile voice and data services operating at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

V. CONCLUSION

The main objective is to promote cleanliness and hygienic atmosphere for the living creatures. This system will help us to constantly check level of the bins. When the bins are filled the collectors are informed to immediately check and empty them. This system is useful for atmospheric cleanliness which further prevent many harmful diseases. Ultrasonic sensor is being used in the system for checking level of bins. Firstly we can use them in small localities if successful can be used in large cities. It makes the work easy of the workers and people using it.

REFERENCES

- [1] Monika K A, Rao N, Prapulla S B and Shobha G, "Smart Dustbin-An Efficient Garbage Monitoring System", International Journal of Engineering Science and Computing, 2016.
- [2] I. Hong, S. Park, B. Lee, J. Lee, D. Jeong, and S. Park, School of Electrical and Electronics Engineering, Chung-Ang University, Seoul, "The Scientific World Journal" Volume 2014.
- [3] Navghane S S, Killedar M S and Rohokale D V, "IoT Based Smart Garbage and Waste Collection Bin", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) 2016.
- [4] H.K Manasi and B.S Smithkumar, "A Novel approach to garbage management Using Internet of Things for smart cities", International Journal of Current Trends in Engineering & Research 2016.
- [5] A. Medvedev , P. Fedchenkov ,A. Zaslavsky ,T. Anagnostopoulos and S. Khoruzhnikov, "Waste management as an IoT-enabled service in smart cities" In Conference on Smart Spaces Springer International Publishing 2015.
- [6] G. Schafer U.S. Patent No. 5,326,939. Washington DC: U.S. Patent and Trademark Office 1994.
- [7] A Anitha IOP Conf. Ser.: Mater. Sci. Eng. 2017.
- [8] Dr N.S Kumar, B. Vijayalakshmi, R. Jeniferprathana, A Shankar, "IOT Based Smart Garbage alert system using Arduino Uno"
- [9] S Balamurugan, A. Abhishek, S. Ratnakaran, S. Balaji, R. Marimuthu, N. Sathish Kumar, B. Vijayalakshmi, R. Jenifer Prarthana, A. Shankar, "Design of Smart Waste Management System", IOT based Smart Garbage alert system using Arduino UNO, 2017.
- [10] S. V Kumar, T. Senthil Kumaran, A. Krishna Kumar, "Smart Garbage Monitoring and Clearance System using Internet of Things", IEEE, 2017.

[11] V.K. Kurre, "Smart Garbage Collection Bin overflows Indicator using IOT", International Research Journal of Engineering and Technology (IRJET), vol. 03,2013.

[12] P. R. Naregalkar, K.K Thanvi, R. Srivastava, "IOT Based Smart Garbage Monitoring System", International Journal of Advanced Research in Electrical Electronics and Instrumentation Engineering, vol. 6, no. 5, May 2017.