Smart Bin: A Swach Bharat Approach using NodeMcu

Margrat C R[1], Navia Davis[2], Maneesha Martin[3], Livya George[4]

[1,2,3]Student, Sahrdaya College of Engineering and Technology, Kerala[4]

[4]Assistant Professor, Computer Science, Sahrdaya College of Engineering and Technology, Kerala, India

ABSTRACT

We often see that the garbage bins placed at public places overflow, creating unhygienic conditions. Most of the people are reluctant to dump the waste properly in the waste bins. Due to this the waste pile up near the waste bin and also produces bad smell. Improper waste management leads to environment pollution. This paper proposes a smart waste management system that alerts the municipal authorities my displaying a flash message on their website. The ultrasonic sensor attached to the bin will check the status of the bin i.e., whether the bin is full or not. The user has the provision to register on the website by using his/her mobile number. Once registered, he/she can enter that number on the keypad provided on smart bin to gain reward points for each waste deposit. Maximum reward points that can be collected per day is limited to 10.

Keyword: *NodeMcu, Ultrasonic Sensor, Motion Sensor etc.*

1. INTRODUCTION

The unstoppable population explosion has lead to a massive increase in production of raw materials and consumable end-user products. The amount of waste generated is directly proportional to the production. Since the generation of refuses cannot be curbed anytime soon, the only alternative is intelligent waste management practices. The limited natural resources need efficient methods and systems for recycling and processing of the wastes for a better, cleaner environment. Cities are becoming increasingly aware of the problems related to conventional methods of waste collection. In general, waste may be defined as unwanted materials that are not prime products which are of no further importance to a human in their actual form. Waste may be generated during the extraction or processing of raw materials, consumption of final products and human activities. They can thus be classified as industrial waste, clinical waste, and domestic waste. Improper disposal of garbage has many hazards affecting all forms of life leading to contamination of air, water, and soil and also causes dangerous diseases in human beings. Waste management is one of the primary problems that the world faces irrespective of the case of developed or developing country. Although some action has been taken from the government against this, poor management of waste has led to the emission of greenhouse gases. Hazardous wastes pollute the environment in various ways. Even before such wastes are safely disposed of, they pollute the air, water, soil and also pose a threat to human life. The key issue in the waste management is that the garbage bin 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 & ugliness to that place which may be the root cause for the 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 intelligent garbage alert system for a proper garbage management.This project proposes a smart alert system for garbage clearance by giving an alert signal to the municipal authorities for instant cleaning of dustbin with proper verification based on the level of garbage filling. In association with Swachh Bharat Abhiyan - a nationwide cleanliness campaign run by the government of India and initiated by the Prime Minister, Narendra Modi on 2nd of October in 2014 on 145th birthday anniversary of the Mahatma Gandhi – we are also adding a special feature which promotes the people to use the garbage bins. Special reward points are provided to the registered users for each deposit of waste in the garbage bin. Maximum points that can be collected per day is 10.

2. EXISTING SYSTEM

Sensor Based Waste Collection Bin is used to identify the status of waste bins if it is empty or filled so as to customize the waste collection schedule accordingly and also save the cost. Real-time waste management system by using smart dustbins to check the fill level of dustbins whether the dustbins are full or not, through this system the information of all smart dustbins can be accessed from anywhere and anytime by the concerned person. It will inform the status of each and every dustbin in real time so that concerned

authority can send the garbage collection vehicle only when the dustbin is full. By implementing this system resource optimization, cost reduction, effective usage of smart dustbins can be done.

3. PROPOSED SYSTEM

Features of the system include garbage overflow indication, swacch bharath points and thus results in a proper waste management system and completely waste free environment. The proposed system alerts the authorities when the dustbin overflows. We have observed that the municipal officer or the government authorized person will monitor the status of the dustbin. Or generally, we see that they have a regular schedule of picking up these garbage bins or dustbins. This schedule varies as per the population of that place. It can be once in a day or twice in a day or in some cases once in two days. However, we see that in case there is some festival or some function, lots of garbage material is generated by people in that particular area. In such cases the garbage bin gets immediately full and then it overflows which creates many problems.

So in situations, with help of our project the government authority person can get SMS immediately. So they will get SMS before their periodic interval visit of picking up the dustbin. Then they can go and pick up the dustbins. We are also implementing a system of reward points which promotes the common people to put waste only in the bins. The people can create a swacch bharath account on our website using their phone number. The registered users can enter their mobile number before dumping the waste and gain reward points of maximum 10 per day. This project promotes the people to put the waste into the garbage bin and make the places completely waste free.
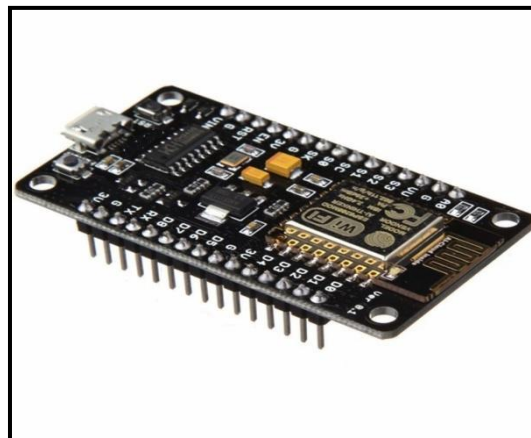

Fig -1: NodeMcu

4. MODULE DESCRIPTION

The proposed system has two modules. The first one is E-monitoring system and the next is web interface system. The E-monitoring system deals with the hardware section whereas web interface system is the software part of the project.

4.1. E-Monitoring System

The three main components of this system are NodeMcu, ultrasonic sensor and motion sensor. The ultrasonic sensor is used to determine if the waste bin is full or not. If the bin is full a flash message is displayed on the website. The Swach Bharat points or reward points are incremented with the help of a motion sensor. The motion sensor detects whenever waste is deposited in the bin and passes this information to NodeMcu. The NodeMcu is used to link all the information collected from both the ultrasonic sensor and motion sensor to the website.

4.2. Web Interface System

The web interface system is regarding the website of the authorities. The user can register on the website by providing mobile number and/or e-mail id. The information collected from the sensors are linked to the website with the help of NodeMcu. This information is used to increment the reward points. The user can login to his/her account to check the status of the reward points.

The user can log in to the website if he/she is registered and check the reward point status. The non-registered user can register by entering the credentials and submitting them. On visiting the dustbin, the registered users can enter their mobile number on the keypad provided and then dispose of the waste which will increment their reward points. The non-registered users can also dispose of the waste by visiting the dustbin. The authority-user interface deals with the interaction of user and authority. When the waste overflows the bin, an alert message is received by the authorities and they can come and collect the waste from the waste bin.

5. TECHNOLOGICAL DESCRIPTION

The major part of this project involves the use of hardware components like NodeMcu, Ultrasonic sensor and Motion sensor. These are the major components of this smart bin.

5.1 Ultrasonic Sensor

The ultrasonic sensor is a device that is used to measure the distance to an object with the help of sound waves. It sends out a high-frequency sound pulse and determines how long it takes for the echo reflect back to it. The sensor has got a transmitter and a receiver on it to transmit-receive the sound pulse.

The ultrasonic sensor can detect even the transparent objects as it can reflect off glass and liquid as well. It is resistant to mist and dirt. It also has the ability to detect complex shapes.
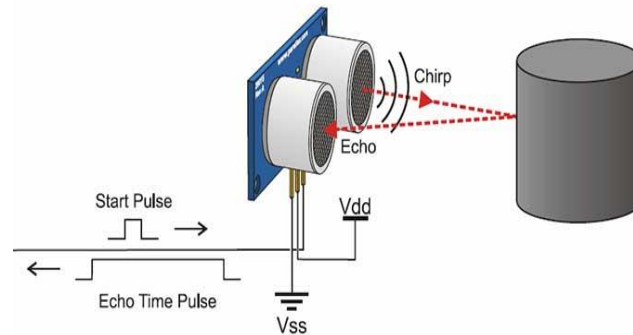

Fig -2: Working of Ultrasonic Sensor

5.2 Motion Sensor

A motion sensor is a device used to detect moving objects or people. They are often referred to as PIR sensors. The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a *positive differential* change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.

5.3 NodeMcu

The NodeMcu is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines or 'C' codes. NodeMCU it is like Arduino Hardware with an Input Output built in the Board itself, it has also a Wifi built in to connect directly to internet to control your things online using Nodejs Style network API for digital network applications, which facilitates developers to code running on the Board, Greatly speed up your Internet of Things application development process. The Development Board base on ESP8266 Chip, integrated GPIO(General Purpose Input Output), PWM(Pulse with Modulation),IIC(Interconnected Integrated Circuit), 1-Wire and ADC all in one board to power up your development board in a fastest way combined with the NodeMCU Firmware

6. CONCLUSION

A proper waste management system is important for the development of any country. For a populated country like India, waste management is an important concern. We are trying to give an effective solution to the waste management issue by our project named smart bin. As the first step of implementation, we have completed the system analysis and the design of the system. We are expecting to complete the prototype work within the next three months. We truly hope that our system can make wonders in the swacch bharath venture.

7. REFERENCES

[1] Microcontroller based Automatic Waste Segregator, M.K.Pushpa, Aayushi Gupta,Shariqh Mohammed Shaikh, Stuti Jha, Suchitra V
[2]Automated Waste Segregator, Amrutha Chandramohan,Joyal Mendonca,Nikhil Ravishankar, Nikhil U Baheti, Nitin Kumar Krishnan, Suma MS
[3] Daniel V., Puglia P.A., and M. Puglia (2007). "RFID-A Guide to Radio Frequency Identification", Technology Research Corporation.
[4] Flora, A. (2009). "Towards a clean environment: A proposal on sustainable and integrated solid waste management system for university Kebangsaan Malaysia". Report from Alam Flora.