Smart Monitoring System for Swachh Bharat

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Abstract— The objective of this proposed work is to monitor the waste management system. The new era of web and Internet of things paradigm is being enabled by the proliferation of various devices like sensors, GSM modules and LCD displays. A smart device is embedded in the environment to monitor and collect all types of information. In this project, we specifically focus on the adaptation of smart device as a key enabling technology in contemporary waste management. We use sensors like MQ2, MQ3, fire, Load and IR sensor to detect smoke, harmful smell, fire, weight and the level of garbage in the large dustbin (one big dustbin for a community in that area or one for a building) which collect garbage from that locality or building and send a message through GSM module.

Keywords— *SST* MC, IR sensor, MQ2, MQ3, Fire sensor, Load sensor, LCD display, GSM module.

I. INTRODUCTION

Most of the developing countries are facing major environmental challenges associated with the waste generation and inadequate waste collection, transport, treatment and disposal. Current systems of waste management in India cannot cope with the volumes of waste generated by an increasingly urban population, new cities, town and this impact on the environment and public health. The challenges are significant, but so are the opportunities. With significance development in technology in the IoT sector in the past couple of years, the hardware is getting cheaper and accessible, the internet is becoming cheaper and faster and more and developers are trying to integrate IoT in every little thing in our life.

With this technology not only we can solve our problem more efficiently and quickly but also we can monitor our progress. In the next decade, most of the urban cities will have more people living in them as per their capacity and most of the rural or semi-rural villages will convert into town so to make sure our city is kept clean and hygienic and out future cities built with proper planning keeping waste disposal in mind.

The goal of the proposes work is to make a device which can accurately measure whether the garbage collection bin(one for each block of houses in that area or for a building) is full or not or is smelly in case it is full or smelly the sensors mounted in the device will send a specific message to garbage collecting company that this area bin is full or smelly so that the driver doesn't travel the entire city every day to check which are full or not this way they will be able to decide a specific route according to their demand that

day and hence will be able to collect garbage more efficiently without wasting more fuel, energy or time of that company. Since the company will get data from every bin there won't be any area that will be missed accidentally keeping the city fully clean.

II. SIMILAR *PAST PROJECTS*

There have been many past proposed works both on big and small scales to tackle the problem of waste management. Some of the famous projects are IR proximity sensor equipped dustbins in the airport to constantly keep the dustbin empty and clean (IJARCCE volume 5 issue no.3 e-ISSN 2278 1021 ISSN 2319 5940). Machines built to separate solid and liquid waste. Most of these works in this sector are more focused on dealing with the disposal of waste rather than how to efficiently collect it in one place. Project to make the road out of waste, recycling the plastic waste and bio-decomposing the liquid and decomposing material are the most popular waste management tactics but the projects to collect these waste has never become a mainstream problem.

III. METHODOLOGY

Our proposed work aim is to make a device which correctly measure the amount of waste in the garbage and whether the garbage is releasing smell, smoke or is on fire and then send us information through GSM module so that we can effectively deal with the problem.
The major components of this device are:
1. SST microcontroller
2. MQ2 SENSOR
3. MQ3 SENSOR

4. IR SENSOR
5. FIRE SENSOR
6. LOAD SENSOR
7. GSM MODULE
8. LCD DISPLAY

1. SST MICROCONTROLLER

SST (silicon storage technology) microcontroller (figure b) is the main centre part of the project. Here we are using the 8051 based Philips SST 89E516RD2 microcontroller. The 89E516RD2 are 80C51 microcontrollers with 64kB flash and 1024 B of data RAM. A key feature of the 89E516RD2 is its X2 mode option. We compile and dump the code (written in embedded c) in the microcontroller (figure A) which takes input from the entire sensor and give us the output from the gsm module via SMS to the predefined number and also through the LCD display. The MQ3 (figure C), MQ2 and the IR sensor take the input and with the help of the code installed in the module they decide when to trigger and what to do after its triggered.

2. MQ2 SENSOR

This sensor module (figure c) is useful for gas leakage detection. It is suitable for detecting H2, LPG, CO, CH4, Alcohol, Smoke or Propane. Due to its fast response time and high sensitivity, the measurement can be taken as soon as possible. If there is smoke coming out of the garbage then the sensor is triggered and then it alerts the SST microcontroller.

3. MQ3 SENSOR

This sensor (figure d) detects alcohol, benzene, hexane, CH4, CO and other gases. If the garbage in the garbage bin starts rotting then this sensor will effectively detect it and will send the input to the SST microcontroller which will then decide whether the smell is above the safe level or not and then it will trigger so that necessary steps required can be started. Its effective sensing range is from 0.04mg/L to 4mg/L degree Celsius. The sensor can activate from the range of -10 to 50 degree Celsius.

4. IR SENSOR

This sensor (figure e) measures the distance using IR waves. An IR proximity sensor works by applying a voltage to a pair of infrared light LED's which in turn, emit infrared light. This light propagates through the air and when it hits the object it comes back. The closer the object is the denser the reflected light wave.

With this sensor, we can determine whether the garbage bin is full or not and then send the message to the SST microcontroller. With this, we can determine whether the dustbin is full or not.

5. FIRE SENSOR

A fire sensor (figure f) works by detecting flame up to the distance of 1m. This sensor helps us to make sure that there is no fire in the garbage at all times. In case there is a fire the sensor will trigger and send the information to SST microcontroller.

6. LOAD SENSOR

This sensor module (figure g) uses a load cell to determine the weight of the object. It can take the maximum weight up to 5kg. This sensor module is kept at the bottom of the garbage to measure if the garbage is going overweight or not. In case it exceeds the limits it gets triggered and sends the information to the SST microcontroller.

7. GSM MODULE

This device (figure h) works as an output for the device. When the program decides whether if any one of the sensors has been triggered then SST microcontroller send SMS through the GSM module in the predefined number with the predefined message. The message will contain which dustbin has been triggered and the number it will go to belongs to the garbage management company. It uses a 2G SIM card to connect to the tower of that telecom provider.

8. LCD DISPLAY

It is a (16 x 2) LCD display (figure I) which is mounted on the top of the SST microcontroller. Its displays the predefined message stored in the program when a sensor is triggered. Its main purpose is for near buy garbage user to know that what message has been sent to the collecting authorities and also to know the current situation of the garbage bin.
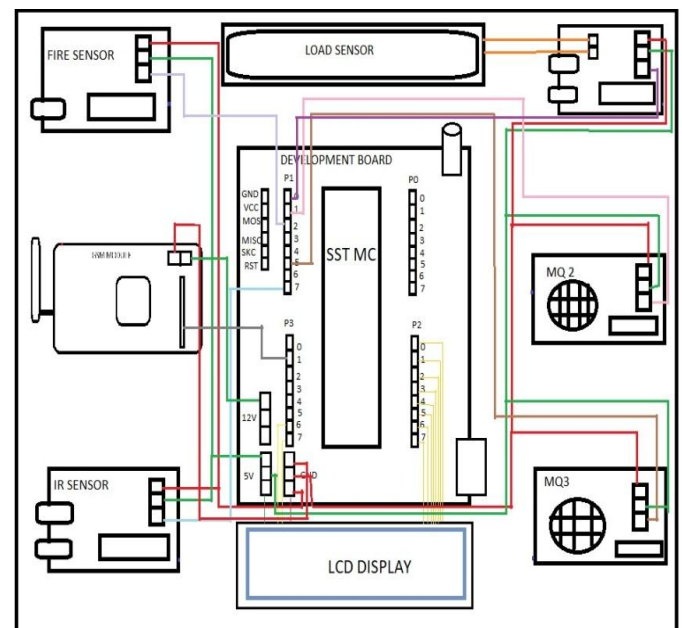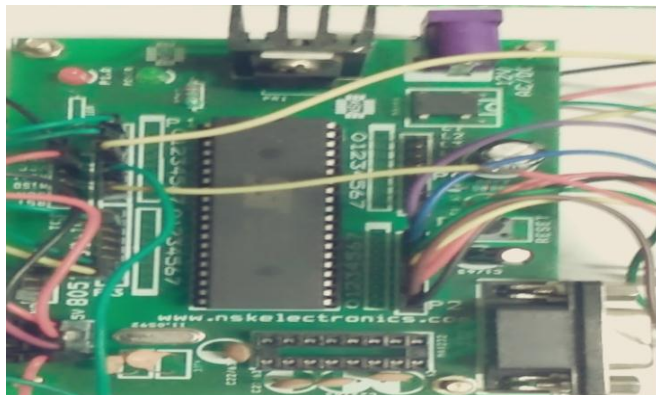
VI. DIAGRAM

Figure 1- Diagram of the device
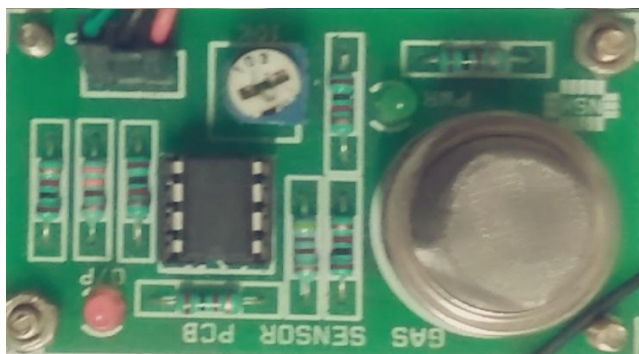
Figure 2- SST microcontroller

Figure 6- Fire sensor

Figure 3- MQ2 sensor
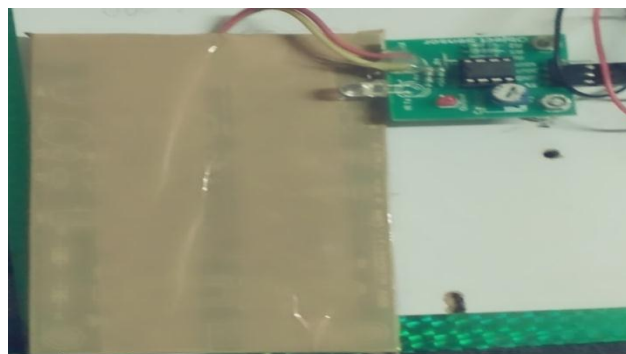
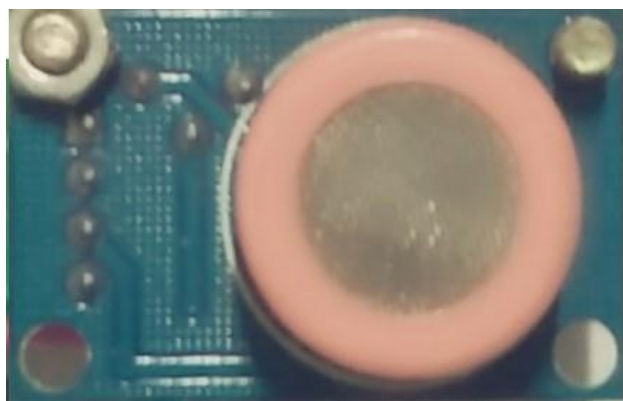**Figure 7 - Load sensor**

Figure 4- MQ3 sensor

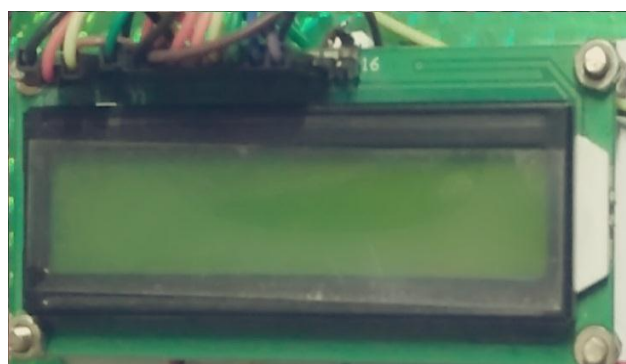**Figure 8- GSM module**

Figure 5- IR sensor
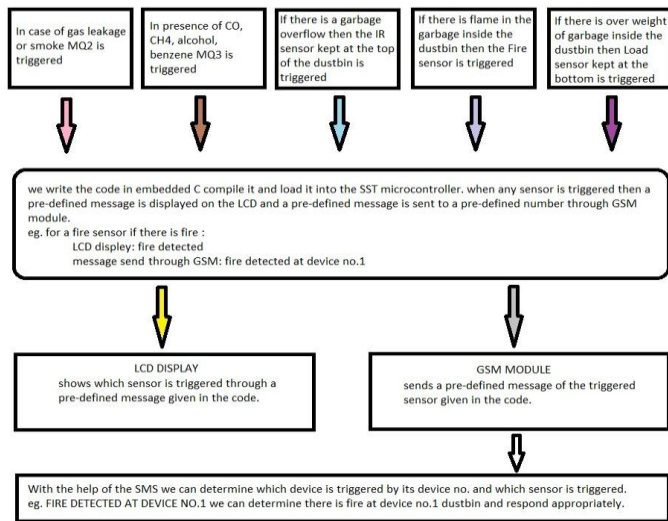
Figure 9- LCD display

Figure 10- flow chat of the entire process

V. RESULT

The test dustbin was able to detect LPG gas, smoke, fire, bad smell and waste level and send a SMS to a pre-defined number alerting them about the problem. The LCD display also showed which sensor was triggered. The SMS also contained the device number. With the device number we can determine the location of that dustbin.

VI. COMPARISON

When we compare the proposed work with the existing works the major difference is that the existing system only measures the level of garbage filled. It doesn't check whether there is a bad smell coming from days old garbage or not or about any other problems like fire. The existing system doesn't use GSM module to send a SMS about the condition of garbage because the old system is built to work in a relatively small dedicated space like only in the airport area so they use WIFI but ours is made to work in a larger scale like in a whole city.

VII. CONCLUSION

The proposed work is made to make the job of municipality/ garbage collection authorities easy and efficient by giving them the exact problem at their dustbin and their address so they can customize their route for that day hence giving them the exact destination they need to travel to collect the waste from the dustbins which are full, releasing bad smell, smoke or in fire. This reduces the cost of the operation by decreasing the fuel consumption, saving time and keeping the process organized. This also helps the environment because there will be less fuel consumption, less release of CO_2 and quick work completion means less noise pollution and less traffic.

VIII. FUTURE DEVELOPMENT

In association with the proposed work an android App can be implemented which will help people to take picture and live location of the garbage and send it to the relevant authority official email address. With this we will be able to clean the road side garbage and illegal dumping grounds.

REFERENCES

[1]. Monika K A, Nikitha Rao, Prapulla S B, Shobha G "Smart Dustbin-An Efficient Garbage Monitoring System" IJESC ISSN 2321 3361 Volume 6 Issue No. 6

[2]. Nimmi Pandey, Shubhashree Bal, Gajal Bharti, Amit Sharma "Garbage Monitoring and Management using Sensors, RF- ID and GSM" International Journal of Innovative and Emerging Research in Engineering p-ISSN: 2394 5494Volume 2, Issue 3, 2015

[3]. Kanchan Mahajan, Prof. J.S.Chitode "Waste Bin Monitoring System Using Integrated Technologies" International Journal of Innovative Research in Science, Engineering and Technology ISSN: 2319 8753 Vol. 3, Issue 7, July 2014

[4]. Ann Mary Thomas, Annu Reji Philip, Tessy Elsa Peter, Er. Nishanth P R "Dust Bin Monitoring System" International Journal of Advanced Research in Computer and Communication Engineering ISSN (Online) 2278-1021 ISSN (Print) 2319 5940Vol. 5, Issue 3, March 2016

[5]. S.S.Navghane, M.S.Killedar, Dr.V.M.Rohokale "IoT Based Smart Garbage and Waste Collection Bin" International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) ISSN: 2278 – 909X Volume 5, Issue 5, May 2016

[6]. Sandeep M. Chaware, Shriram Dighe, Akshay Joshi, Namrata Bajare, Rohini Korke "Smart Garbage Monitoring System using Internet of Things (IOT)" International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering ISSN (Online) 2321 – 2004 ISSN (Print) 2321 – 5526 Vol. 5, Issue 1, January 2017

[7]. https://github.com/jakubroztocil/geotagger

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