

Online Garbage Monitoring System Using Arduino and LabVIEW

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Abstract— This paper presents an inventive system which will help to stay 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 and alert the users through buzzer and LED's. The ultrasonic sensors (HC-SR04) used in the system to detect the garbage level which is positioned over the bins. It is then compared with the garbage bins depth. The hardware architecture of the system includes Arduino module, LCD, sensor and buzzer. The status of the level of garbage collected in the bins is displayed on LCD screen. The remote monitoring of the system is done through a web page developed by using VISA tool in LabVIEW. When the level of garbage collected crosses the set limit then buzzer indication starts their action. Hence this system helps to maintain the city clean by informing about the garbage levels of the bins.

Keywords—LabVIEW, VISA, Arduino, Ultrasonic Sensor, LCD

I. INTRODUCTION

Communal waste-bins are stodgy up faster than ever and unavoidably many of the bins end up spilling over before collected, causing untidy streets, awful odour, negative health and environmental impacts. The problem is that so much garbage is collected from houses, they put their garbage in open area and because of this the garbage is overflowing from the dustbins. It results in polluted environment and causes bad effects on human and animal health. A bacterial disease is the source of Garbage pollution. Also various diseases such as gastrointestinal, stomach pain, vomiting, cholera, typhoid, malaria that are caused by the garbage.

To avoid such a problem we developed an online garbage monitoring system. This system is supportive for to keep the city clean and tidy. The objectives of this online garbage monitoring system are to judge the maturity level in the garbage bins to stay the cities and environment hygienic & emerald. Many researchers have been worked against the dangerous effects of garbage monitoring, significant efforts was carried out in manipulative and miniaturizing the garbage monitoring sighting technique. Several researchers have published their statistical data incidents. In 2012, M. Al-Maadeed proposed a paper that gives a preface of an incorporated system combined with an integrated system of RFID, GPS, GPRS, GIS and web camera will resolve the difficulty of solid waste [1]. Md. Shafique, in 2012, described a system that uses Zigbee and GGM techniques for better management of garbage [2]. Kanchan Mahajan developed a system to concentrate on eradicating ugliness

and disorder. It uses IR and gas sensor. The level of the trash inside the bin was detected using IR sensor and gas sensor will sense the toxic gases [3]. The overflowing of trash to the corporation office was informed by RFID used in the system.



Fig.1

The existing garbage monitoring systems are so costly and difficult to handle. We developed a system that is cost effective and portable. Any common people can purchase it easily

II. SYSTEM DESIGN

A. Block diagram representation

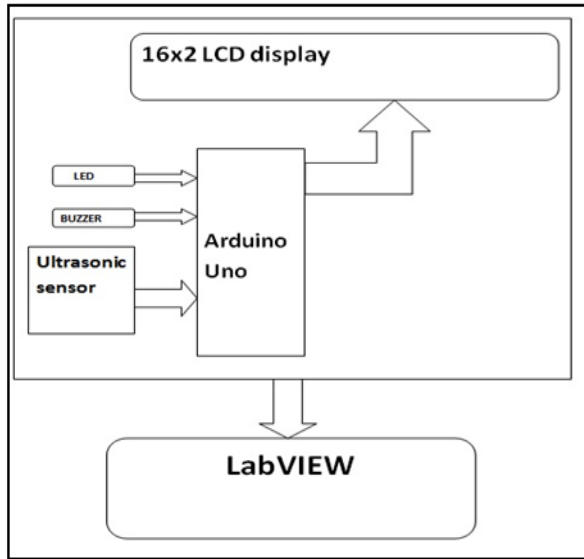


Figure 2: Block diagram representation of online garbage monitoring system

This system uses ATmega16L microcontroller to take any logical decision or any controlling action. The present system uses an ultrasonic sensor for measurement of the distance of an object by using sound waves. The distance measurement is done by sending a sound wave at a definite frequency and listening for that sound wave to bounce back. Buzzer is used for user alert. LCD, LED & buzzer are also interfaced to arduino board. The Arduino pins 12 and 13 are connected to echo and trigger pins of ultrasonic sensor. The VCC and GND pins of both are made common. The pin of LCD RS, R/W and E are connected to the Arduino pins 11,10,9 respectively. The digital output pins DB₄, DB₅, DB₆ and DB₇ of LCD are connected to the pins 2,3,4,5 of Arduino respectively. The two led's and one buzzer are connected to the Arduino pins of 6, 7, 8. All the data from the microcontroller is displayed on LCD. While LabVIEW tool is used to develop effective GUI of the present system. Also, VISA function tool in LabVIEW is used to develop the webpage of the present system [4]. Arduino used in a present system is an open-source prototype platform based on user-friendly hardware and software. Arduino_boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on a LED, publishing something online. All this is defined by a set of instructions programmed through the Arduino software (IDE). An integrated development environment (*IDE*) is a software application that provides comprehensive facilities to computer programmers for software development. We used an ultrasonic sensor for measurement of the distance of an object by using sound waves. It measures distance by transfer out a sound wave at a

specific frequency and listening for that sound wave to bounce back. This sensor sends out a sound pulse and measure a time how long it takes for the echo of that pulse. It has two openings on its front. One is transmitter and other is receiver.

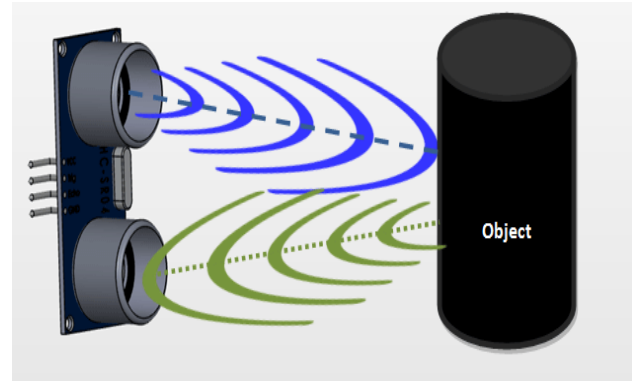


Fig.3

III. CIRCUITS DIAGRAM AND ITS IMPLEMENTATION

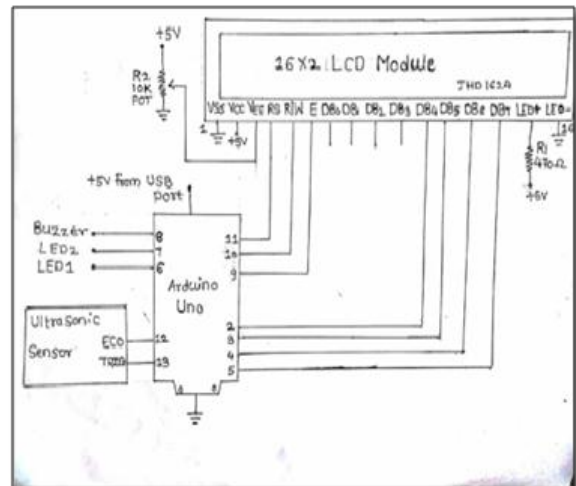


Figure 4. Circuit diagram of garbage monitoring system

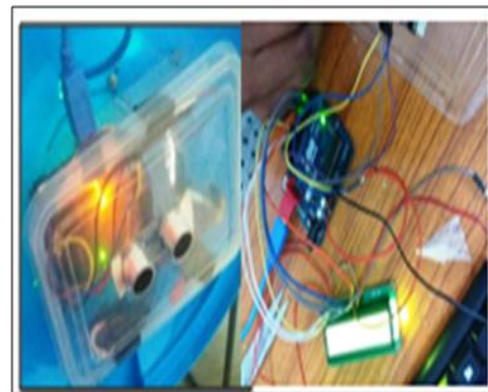


Figure 5. Hardware implementation of a system

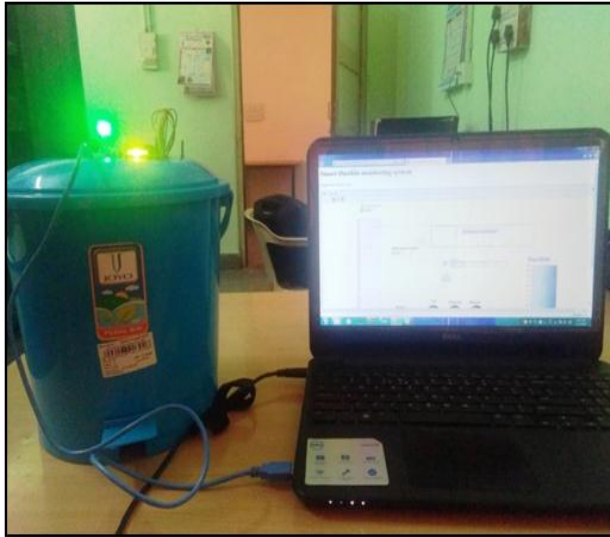


Figure 6. Experimental set up for garbage monitoring system.

IV. WORKING OF THE PROPOSED SYSTEM

The system manoeuvre is shown in experimental arrangement (figure 4). The instant depth of the litter bin is sensed by using HC-SR04 ultrasonic sensor. This HC-SR04 ultrasonic sensor is interfaced to microcontroller which is mounted on arduino UNO board. This microcontroller received all the data from the sensor and performs logical decision on it. According to microcontroller output, it will decide instantaneous depth of the bin. As soon as the dustbin is filled by the garbage the ultrasonic sensor measure the distance in the dustbin using frequency of sound wave & it will warn the level of garbage.

On our proposed system, there are three threshold levels: If the garbage is filled upto 10% then the green led is glow, if the garbage level is upto 75% then yellow LED glow, the red led is glow if the garbage is filled by greater than 10m and upto 100%, the buzzer starts to buzzing the alarming sound and alerts the user so that filled bin is replaced with another bare rubbish bin. The whole system is again interfaced to LabVIEW using VISA function tool in it. This performs serial communication between arduino and other peripheral. We monitor the garbage level online by creating the web page for it.

V. SOFTWARE IMPLEMENTATION OF A SYSTEM

A. Arduino IDE

This study was carried out using arduino microcontroller. For this we have used arduino IDE (Integrated Development Environment). Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-

controller into a more accessible package. Arduino programming for the ultrasonic sensor and its results in serial monitor window of the arduino IDE is shown in figure 7. The whole Arduino IDE programming for garbage monitoring system is shown in figure 8.

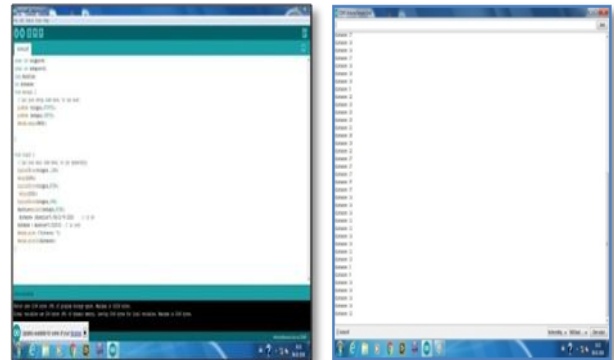


Figure 7. Arduino programming and Its results for the ultrasonic sensor.

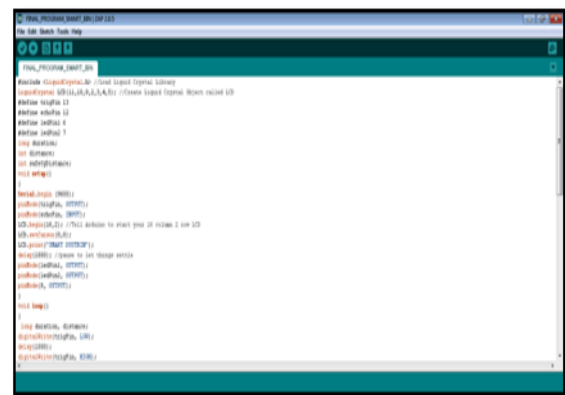


Figure 8. Arduino programming for garbage monitoring system.

B. LabVIEW

LabVIEW is a graphical development environment for escalating conventional applications. The tools present in LabVIEW make it more users friendly. Any non-programmer can do the LabVIEW programming easily using drag and drop option. The G code is the heart of LabVIEW programming [5,6]. The G-code created by LabVIEW is more perceptible to use than other programming languages. A reduced amount of time is required to run the G-code. LabVIEW possess different types of tools to make the system interactive.

The present wireless gas sensing system uses the web publishing tool in LabVIEW to display the monitored data on the web page for remote monitoring. The LabVIEW programming for garbage monitoring system is shown in figure 9.

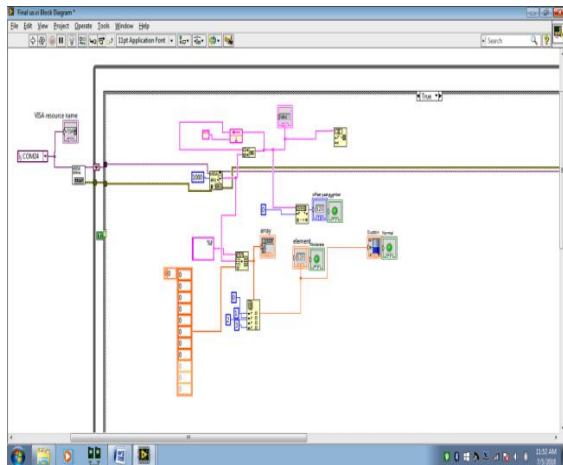


Figure 9. LabVIEW programming for garbage monitoring system.

VI. RESULTS AND DISCUSSIONS

The figure below shows the graphical user interface developed on LabVIEW software. It makes our system user friendly. The GUI created using LabVIEW is an interactive and facile. It shows the current data of garbage bin. The noticeable benefit of this tool is that any non-programmer can develop its own algorithm using drag and drop option in it. We have obtained observations of sensor from the arduino into front panel of LabVIEW. The LabVIEW programming for garbage monitoring system is shown in the following figures respectively. The figure 10 show that when the level of garbage bin is 10% then green LED will glow on the GUI of the system. For the ease of users, tank is considered as a dustbin in LabVIEW. All the data coming from sensors are displayed on VISA port of the LabVIEW.

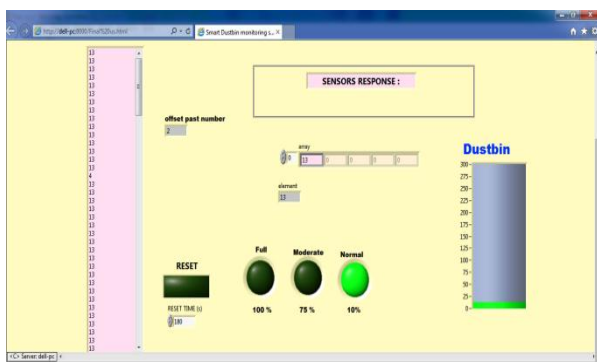


Figure 10. LabVIEW programming for normal level of dust bin.

The figure 11 shows that the garbage level is 75% of depth of the bin i.e. moderate level. Here the yellow LED is blinking.

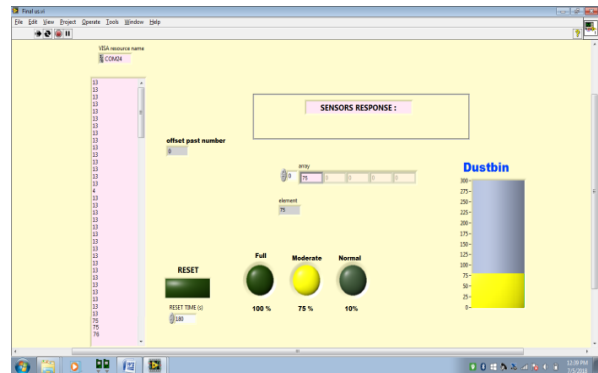


Figure 11. LabVIEW programming for moderate level of dust bin

When the garbage level is beyond its limit i.e. dustbin is overflow (full) and then red LED is blinking. It is shown in figure 12.

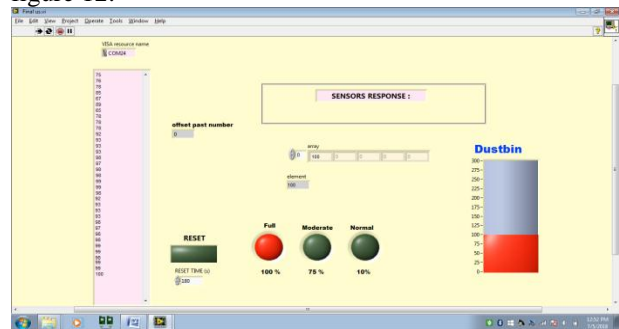


Fig. 12. LabVIEW programming for full level of dust bin.

C. Internet control of garbage monitoring system

We have built a simple VI that is run on internet using web publishing tool in LabVIEW. We launched this application in the internet and monitored it remotely and controlled it automatically. The document URL obtained from the LabVIEW page is <http://dell-pc:8000/final.html>. Where 8000 is a port address. Figures 15 and 16 shows the smart dust bin monitoring system in the internet browser. It will give an advantage to user for monitoring the dust bin level at remoteness continuously. It helps to keep our environment clean. The prototype result of smart garbage monitoring system is shown below.



Fig.13

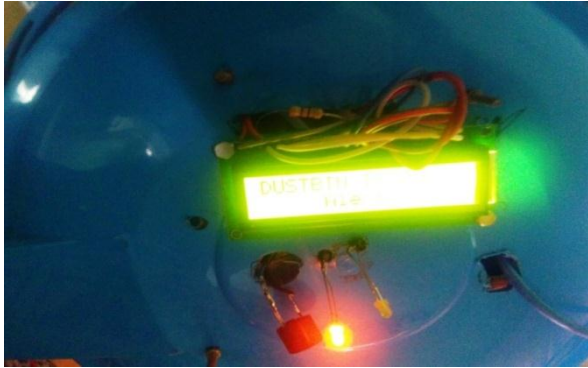


Figure 14. Prototype result of the system.

The web page display of garbage monitoring system is shown in figure 12 and figure 13.

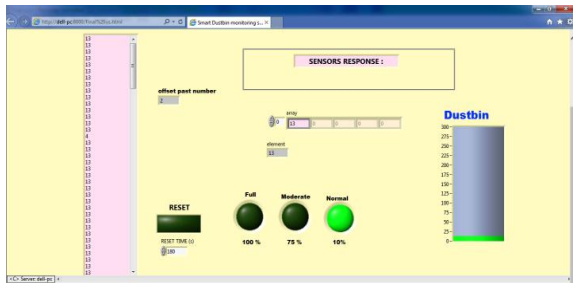


Figure 15. Web page display of garbage monitoring system

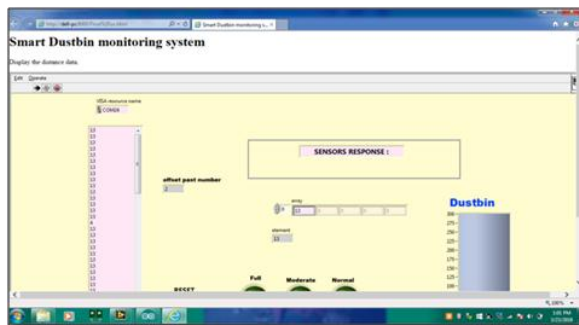


Figure 16. Online garbage monitoring system

VII. CONCLUSIONS

An Arduino based smart garbage monitoring system is developed to monitor the garbage through the city. The system is cost effective and portable in informing the users about the status of the garbage at dust bin. By alerting the status of the garbage levels to the users and displayed it on the webpage which makes the system more steadfast and proficient. The hardware and software can be customized and redeveloped according to the necessity of the system. The online monitoring makes the system more efficient and reliable.

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