

IOT Based Intelligent Bin for Smart Cities

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Abstract— The method of connecting the objects or things through wireless connectivity, Internet called Internet Of Things. Nowadays a variety of tasks are based on IOT. Cities in the world are becoming smarter by implementing the things around using IOT. This is a new trend in technology. Smart cities include obstacle tracking, object sensing, traffic control, tracking of our activities, examining the baby, monitoring home lights and so on. One of the objective of smart cities is keeping the environment clean and neat. This aim is not fulfilled without the garbage bin management system. Hence the paper “IOT Based Intelligent Bin for Smart Cities” has been developed. Bin management is one of the major applications of IOT. Here sensors are connected to the all the bins at different areas. It senses the level of garbage in bin. When it reaches threshold a message is sent via GSM to the concerned person to clean it as soon as possible. The completed task is done in LabVIEW environment.

Keywords— IR sensors, NI myRIO, GSM Modem, LabVIEW.

I. INTRODUCTION

Garbage management is that the assorting, transporting garbage, processing, reusing or eliminating and monitoring garbage materials. Garbage management is very crucial and it has become one of the major issues due to high population density. To reduce the impact of garbage, Municipal Corporation has developed an efficient garbage management system. In India, waste generated per capita ranges from 200g to 500g. Many organizations have estimated that in India 1.3 to 1.5 pounds of waste is generated for a person. It is even estimated that 47 million tons of waste is generated in the year 2001. In the recent 2 years this has increased to 95 million tons. The efficiency of collecting the garbage is poor in Indian cities compared to other countries. Thus, Indian Government is struggling to manage the garbage. Issues with respect to the disposal has become challenging with growth in population. Poor garbage collection and improper transportation facility are answerable for the earnings of garbage at all spots and points of the city. Due to these unavailable facilities, municipal garbage management is getting critical. Improper garbage management further leads to incurable diseases to living organisms. Thus to avoid waste overflow “Smart Management of Garbage using LabVIEW” has been proposed.

II. PROPOSED METHODOLOGY

For detecting the garbage, many sensors like weight sensors, IR sensors, etc can be used. Weight sensor is the one which gives the information about the weight of garbage. But using this is not efficient because it doesn't identify the level of waste in the bin. Hence Infrared sensor (IR sensor) is used which is a multipurpose sensor, which can detect the level of

garbage. IR sensor emits the light, which is invisible to naked eye but the electronic components can detect it. It consist of IR transmitter and IR receiver. Both analog and digital output is produced by IR sensor. This sensor produces the output a logic '1' at the digital output when it senses the object and a logic '0' when it doesn't senses any object. Depending on the distance between the object and sensor, sensor produces the analog output voltage between 0 and 5V. An LED is present on the IR sensor board. It is used to indicate the presence or absence of an object. IR sensors are highly sensitive to surrounding lights. Hence, these sensors are covered properly in order to reduce the light effect on the sensor. Potentiometer is used to calibrate the sensor.



Figure 1: IR sensor

The output of IR sensor is acquired by The National Instruments myRIO-1900. It is an input output device which is portable and reconfigurable. This can be used by the students in the design of robotics, controls and many other designs. The NI myRIO-1900 has a ZYNQ chip. This ZYNQ chip is a combination of processor (ARM Dual core) and FPGA (Xilinx). The NI myRIO-1900 consists of analog input, digital input, analog output, digital output, power output, nonvolatile memory and audio input and output in an embedded device. USB acts as a connector between the NI myRIO-1900 and host computer. It has connectors A and B that acts as an expansion port and a connector C that act as a mini-system port, they carry the signals and these signals are distinguished by different connector names. Here the mostly used connector is mini-system port connector C. This device can even connect to the wireless network and create wireless network. It has inbuilt option to connect to Wi-Fi.



Figure 2: NI myRIO-1900

Wireless communication can be achieved using many devices. Those devices are Zigbee, GSM, etc. In this project GSM is used. Zigbee can also be used but the disadvantage with it is its short range, less complexity and the speed of data is less. Hence compared to Zigbee, GSM has more advantage because it is simple to use and its less cost. GSM modem is a unique type of wireless modem, accepts a SIM card and it operates similar to mobile phone with its own specific mobile

number. GSM modem mainly consists of antenna for wireless communication, SIM holder, communication port, ON or OFF switches and power supply. A GSM modem is connected to the computer via serial or USB cable. The advantage of connecting is it provides mobile network to the computer to transfer and exchange information with modems. Meanwhile it provides mobile internet connectivity and also used for forwarding the SMS and MMS messages.

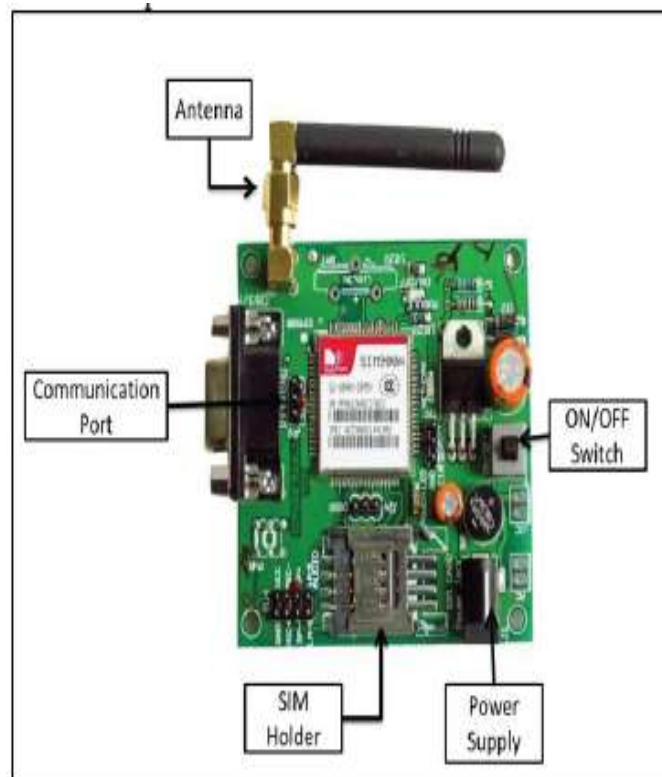


Figure 3: GSM modem

III. FLOW CHART

The flowchart of the project is shown in Figure 4. It literally provides the idea of this project. The flow of project begins with the start. IR sensor is used which senses the garbage level when it reaches the threshold. When the threshold level is reached the information of how much level the bin is filled, location of the bin, date and the current time when the dustbin get filled are all obtained. Then the level of garbage is examined, if it is filled 100% a message is sent to the respective person to clean the bin as soon as possible via GSM. If it is not filled the process repeats as shown in figure 4.

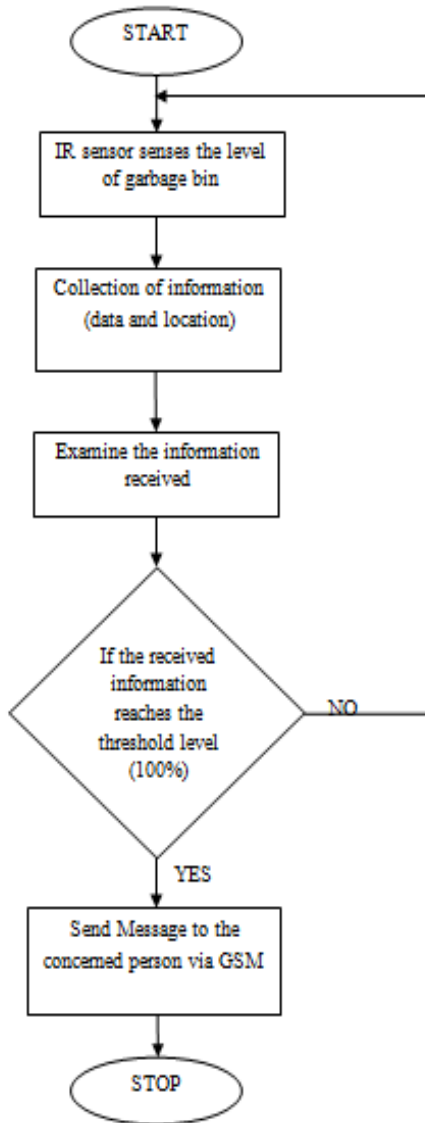


Figure 4: Flow Chart of the project

IV. BLOCK DIAGRAM

A. Transmitter Section:

Transmitter section block diagram is shown in Figure 5. The first block in the transmitter part is the garbage bin. The IR sensor which is the level detect is used to detect and notice the level of garbage in the bin. For each bin, as many sensors can be used to identify the levels as required. Here to detect the different levels of wastes in the bin three to four sensors are used for each bin. When the different garbage level is sensed by IR sensors, the output of sensor is received by NI myRIO. It is connected to internet. When the bin gets filled, NI myRIO provides information of location of bin, respective date and time. The data in NI myRIO, from one of the eight digital input output pin in the mini-system port (MSP) connector C (MSP C) is transmitted to receiver section via wireless network Internet.

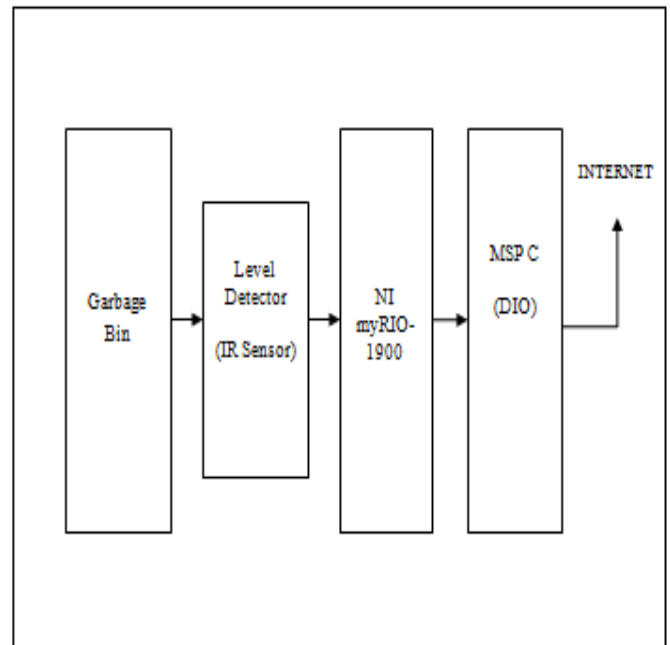


Figure 5: Transmitter section

B. Receiver section:

The receiver block diagram is shown in figure 6. The data from the transmitter is received via Internet. GUI is used to display the system status. GUI is developed using LabVIEW. GUI is displayed on the front panel of the LabVIEW. It displays the status of the garbage bin that is the level of garbage in the bin, time and date and even the location of the bin. Once the garbage bin is completely filled, the message is sent to the concerned person to empty the bin. The message is sent through GSM modem.

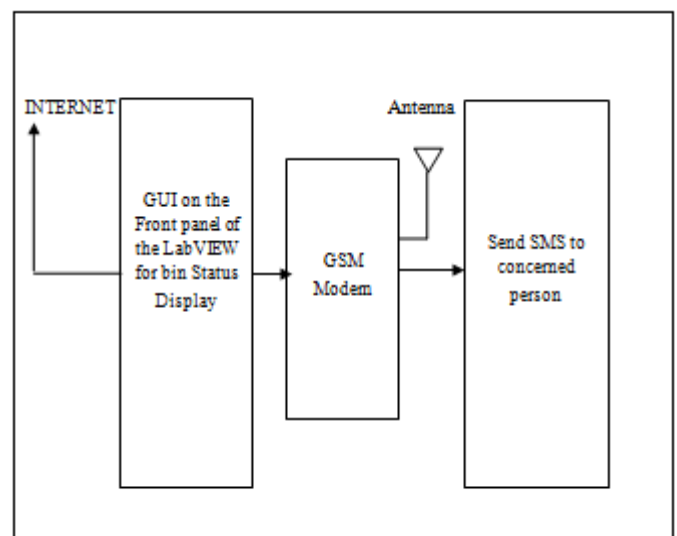


Figure 6: Receiver section

V. RESULT

Sensor senses level of the bin. The graphical representation to access the output of the sensor is as shown below. It gives the output of what level of garbage is filled.

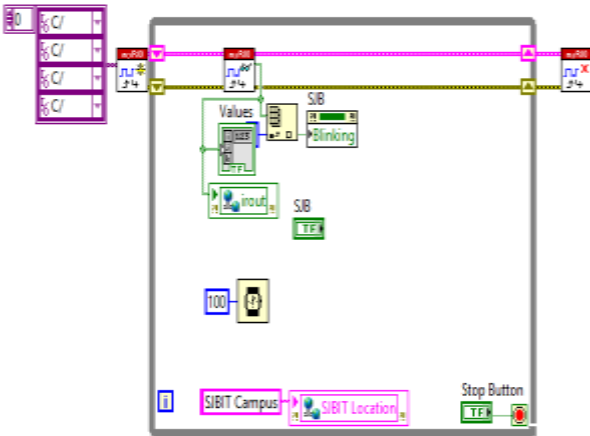


Figure 7: Graphical representation of output of sensor

The system displaying the map of the area where bin is placed is connected to internet and the LED's are placed near the bins. It is as shown in figure 8.

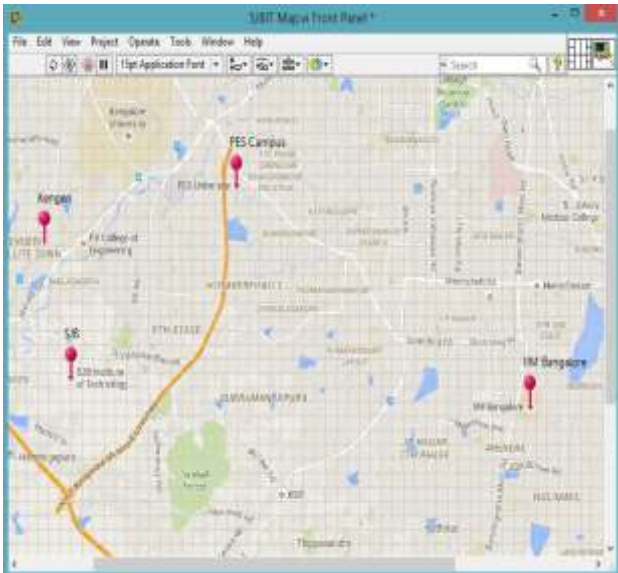


Figure 8: Showing the map and LED's

When the level in a bin is reached the threshold, the LED placed at the location of the bin starts blinking as in the figure 9. It can be visualized in control room.

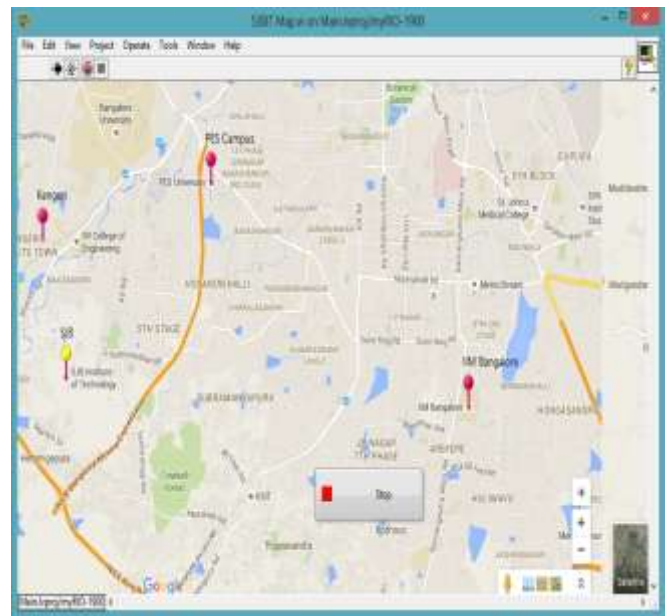


Figure 9: Showing blinking of LED

When the blinking LED is clicked, a display opens as in figure 10 that shows the location of the bin, status of the bin, data and time when the bin gets filled, mobile number and the text to send to the concerned person. The block diagram view of figure 10 is shown in figure 11.

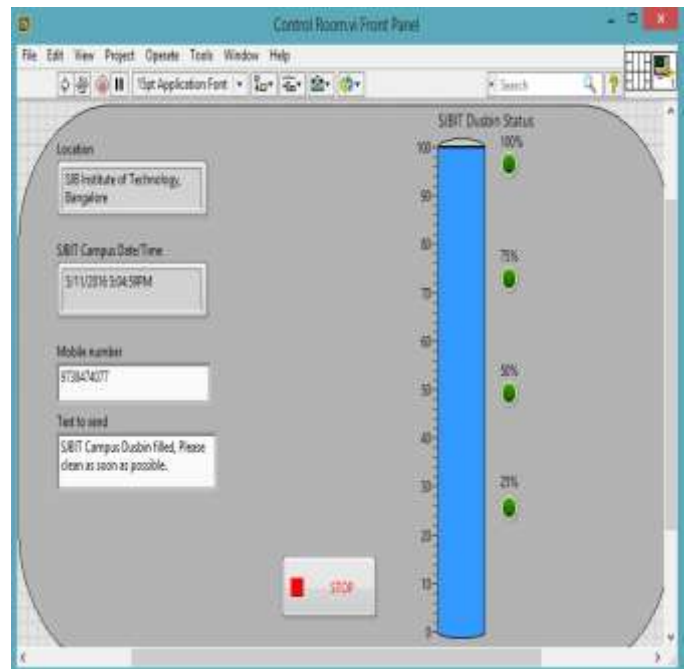


Figure 10: Window displaying status and other information of the bin

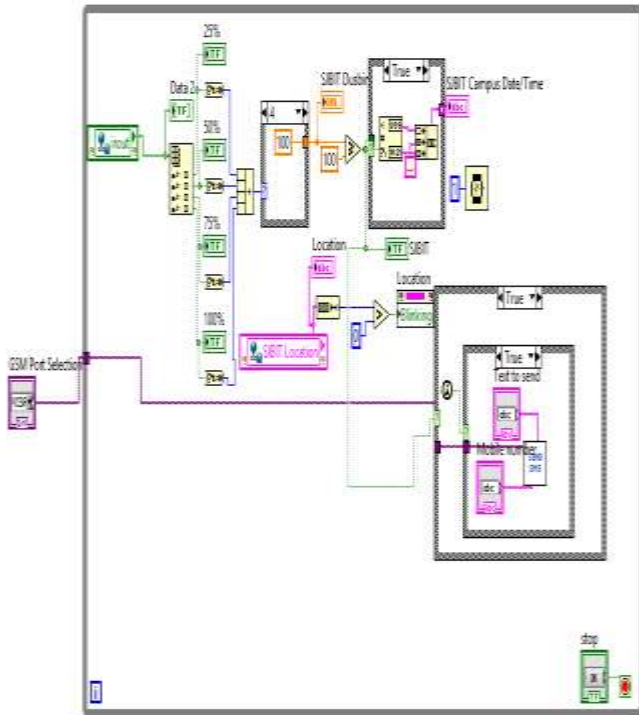


Figure 11: Block diagram view

Once the garbage bin reaches and exceeds the threshold level, a message is sent to the respective person via GSM to empty and clean the bin.

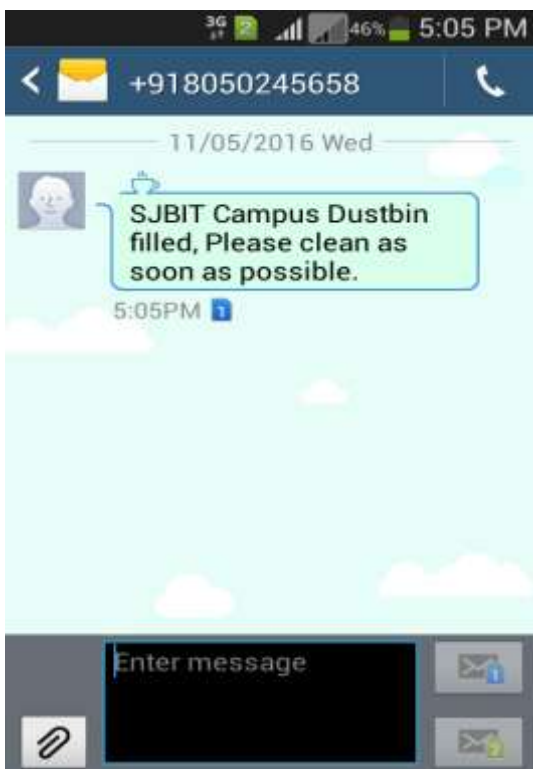


Figure 12: Message which is sent to the concerned person

VI. CONCLUSION

Implementation of managing the garbage using sensor, LabVIEW and GSM is shown in this paper. This paper gives solution of how garbage management can be achieved. This method helps in keeping the waste bin clean when the bin is completely filled. The garbage managing system and the facility of collecting the garbage presently doesn't fit to the current requirement. Hence better facility of collecting garbage and transportation should be provided. Since, this system provides the information when the bin gets completely filled with garbage, it reduces the number of times the arrival of vehicle which collects the garbage. This method finally helps in keeping the environment clean. Thus, the garbage collection is made more efficient.

VII. ACKNOWLEDGMENT

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