IOT BASED INTELLIGENT BIN FOR SMART CITIES

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Abstract: The method of connecting the objects or thingsthrough wireless connectivity, Internet called Internet of Things. Nowadays varieties 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 intchnology. 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 objectives 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

Keyword: IR sensors, NI myRIO, GSM Modem, LabVIEW

1. Introduction
Garbage management is that the assorting, transporting garbage, processing, reusing or eliminating and monitoring garbage materials. Garbage management is very crucial and ithas 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 [1-5].

An issue 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 [6-10].

2. 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 consists of infrared 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 [11-15].

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.

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 act 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 built-in option to connect to Wi-Fi. [16-20]

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 the 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 operates similar to a mobile phone with its own specific mobile number. GSM modem mainly consists of an antenna for wireless communication, SIM holder, communication port, ON or OFF switch 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.

![Flowchart](image)

**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 is 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 5.

**Block diagram:**

**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 detector is used to detect and notice the level of garbage in the bin. As many sensors can be used to identify the levels as required. Here to detect the different levels of waste 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 the sensor is received by NI myRIO. It is connected to the Internet. When the bin gets filled, NI myRIO provides information of location of bin, respectedate 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.

**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.

Given by Cristian’s algorithm:

The simplest algorithm for setting the time would be to simply issue a remote procedure call to a time server and obtain the time. That does not account for the network and processing delay. We can attempt to compensate for this by measuring the time (in local system time) at which the request is sent (T0) and the time at which the response is received (T1). Our best guess at the network delay in each direction is to assume that the delays to and from are symmetric (we have no reason to believe otherwise). The estimated overhead due to the network delay is then (T1-T0)/2. The new time can be set to the time returned by the server plus the time that elapsed since the server generated the timestamp:

$$T_{NEW} = T_{SERVER} + \frac{T_1 - T_0}{2}$$

Suppose that we know the smallest time interval that it could take for a message to be sent between a client and server (either direction). Let's call this time Tmin. This is the time when the network and CPUs are completely unloaded. Knowing this value allows us to place bounds on the accuracy of the result obtained from the server. If we sent a request to the server at time T0, then the earliest time stamp that the server could generate the timestamp is T0 + Tmin. The latest time that the server could generate the timestamp is T1 - Tmin, where we assume it took only the minimum time, Tmin, to get the response. The range of these times is: T1 - T0 - 2Tmin, so the accuracy of the result is: Errors are cumulative. If machine A synchronizes from a server B and gets an accuracy of ±5 msec but server B in turn got its time from server C with an accuracy of ±7 msec, the net accuracy at machine A is ±(5+7), or ±12.

**Conclusion**

We have implemented real-time waste management system by using smart dustbins to check the fill level of smart dustbins whether the dustbins are full or not. In this system, the information of all smart dustbins can be accessed from anywhere and anytime by the concerned person and he/she can take a decision accordingly. By implementing this
proposed system the cost reduction, resource optimization, effective usage of smart dustbins can be done. This system indirectly reducing traffic in the city. In major cities the garbage collection vehicle visit the area’s everyday twice or thrice depends on the population of the particular area and sometimes these dustbins may not be full. Our System will inform the status of each and every dustbin in real time so that the concerned authority can send the garbage collection vehicle only when the dustbin is full. By using cristian’s algorithm the authority can know whether the dustbin is cleaned or not by message alert. This method finally helps in keeping the environment clean. Thus, the garbage collection is made more efficient.

References
