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Smart Garbage Collection Bin overflows Indicator using IOT

Vishesh Kumar Kurre[1]

[1]*Dept. of Electronics & Telecommunication Engineering*, Kalinga University, Chhattisgarh, India

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Abstract - *In our city many times we see that the garbage bins or dustbins placed at public places are overflowing. It creates unhygienic conditions for people. Also it creates ugliness to that place. At the same time bad smell is also spread.*

To avoid all such situations we are going to implement a project called Garbage collection bin overflow indicator using IOT (Internet of Things) technology. In this project we are going to place a sensor (Infrared sensor / proximity sensor) under the dustbin. When the sensor signal reaches to the threshold value, a mail notification (like email, twitter, whatsapp message) will be sent to the respective Municipal / Government authority person. We can also see the density of the Dustbin through internet on a Dashboard, this is a GUI (Graphical User Interface) dashboard so any of the authenticate person will easy check the present condition of the dustbin. So then that person can send the collection vehicle to collect the full garbage bins or dustbins.

1) ***Key Words***: **IOT, IR Sensor, ARM CORTEX M4, Raspberry pi, Internet, GUI.**

1. INTRODUCTION

The universal truth is that wastage of anything is harmful for the society. Still we see wastage of water, electricity etc. in our daily life. The environment is surrounded with natural things but if any calamity or adversity occurs, it distracts the natural environment. The most affecting elements are the water, land, air and noise pollution. Due to this the ozone layer is declining day by day .But the most far reaching municipal solid waste which is very harmful for human beings and the other creatures.

Raipur, the capital city of Chhattisgarh, is located near the center of a large plain, referred as the "Rice Bowl of India" – where hundreds of varieties of rice are grown – and is also the biggest city of the region. With a population of over 1.2 million, the total quantum of municipal solid waste generated in Raipur is approx. 600 tons per day. Municipal Corporation Raipur operates a huge fleet of 983 Municipal and Private Vehicles for collection of waste making 1396 number of trips each day. But still there is overflow of garbage in many areas in Raipur. To avoid this smart garbage Monitoring and collection system is developed in this Project

2. Proposed Methodology

2.1 Internet of Things

IOT is new systems may be communicated via the internet, this does not necessarily mean that the internet as such will change or that there will be a new "form" of internet only intended to be used for information exchange between these new communication tools. For instance, Cisco foresees the IoT and the number of devices connected to the Internet exceeding the number of people populating the entire planet. And that's not just smart phones and tablets. Its sensors enabling a smart grid, smarter transportation flows, tracking the health of cattle, and devices monitoring.

During the implementation of my project we have utilized IOT as the working in the field of networked radio-frequency identification (RFID), tracking the collection vehicle, Dustbin monitoring and other emerging sensing technologies.

3. SYSTEM DISCRIPTION

3.1 Infrared sensor

For the garbage detection, IR sensor can be used. It gives the level of the garbage in the dustbin. It's providing information about the level of the garbage in the dustbin. Hence Infrared (IR) sensor is used for garbage detection. IR sensor radiates light which is invisible to the human eye because it is at infrared wavelengths, but it can be detected by electronic devices.

The IR sensor is act as level detector .The output of level detector is given to the microcontroller. The AT commands are used to facilitate the messaging service through the RF Module. This program is burned in the microcontroller with the help of software. These messages consist of information of garbage levels of respective dustbins.

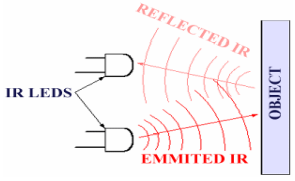

Fig -3.1: IR Sensor

3.2 ARM CORTEX M4

ARM microcontroller used to reads the data from the dustbin sensor and process the data received from dustbin sensor, and the same data send to the Central system.
The Cortex-M4 processor is a low-power processor that features low gate count, low interrupt latency, and low-cost debug. The Cortex-M4F is a processor with the same capability as the Cortex-M4 processor, and includes floating point arithmetic functionality (*Floating Point Unit*). Both processors are intended for deeply embedded applications that require fast interrupt response features.

- Gain the advantages of a microcontroller with integrated DSP, SIMD, and MAC instructions that simplify overall system design, software development and debug.
- Accelerate single precision floating point math operations up to 10x over the equivalent integer software library with the optional floating point unit (FPU) .
- Develop solutions for a large variety of markets with a full-featured ARMv7-M instruction set that has been proven across a broad set of embedded applications
- Achieve exceptional 32-bit performance with low dynamic power, delivering leading system energy efficiency due to integrated software controlled sleep modes, extensive clock gating and optional state retention.

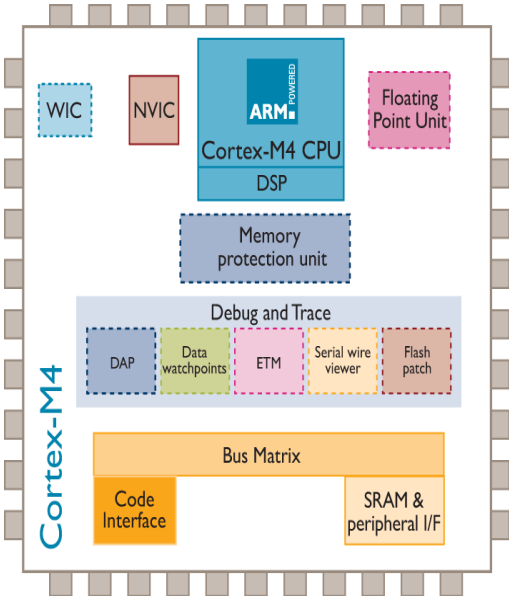

Fig -3.2: Cortex-M4 Processor

3.3 Raspberry Pi

Raspberry Pi is as small as the size of a credit card; it works as if a normal computer at a relatively low price. It is possible to work as a low-cost server to handle light internal or web traffic. Grouping a set of Raspberry Pi to work as a server is more cost-effective than a normal server. If all light traffic servers are changed into Raspberry Pi, it can certainly minimize an enterprise's budget.

The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity, and peripheral device support.

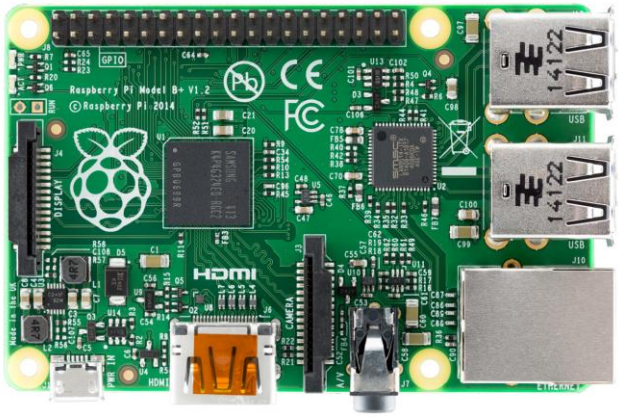

Fig -3.2: **Raspberry Pi**

4. Block Diagram

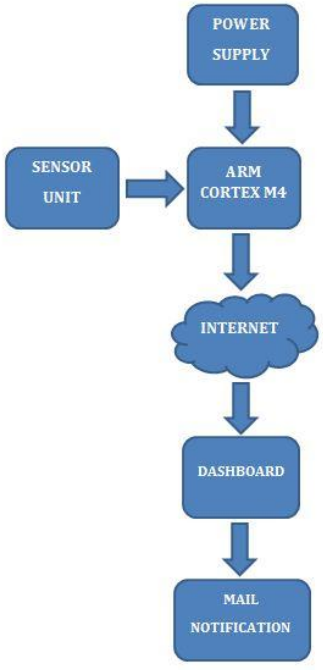

Fig -4: Block Diagram of Working

The Block diagram shows the different component used in the Smart Dust bin System is Power Supply, IR Sensor, ARM Cortex M4, Using Internet and Dashboard/Mail Notification. Sensor is connected in dustbin it is used to detect the level of dustbin where dustbin is full or empty.
The sensor senses the content of the dustbin and sends the signals or the data to the ARM microcontroller then the microcontroller reads the data from the sensor and process the data received from sensor, and the same data will send to Dashboard section and this section send mail/message to respective Municipal / Government authority person or collection vehicle.

5. GRAPHICAL USER INTERFACE

A graphical user interface provides the user with a familiar environment in which to work. This environment contains pushbuttons, toggle buttons, lists, menus, text boxes, and so forth, all of which are already familiar to the user, so that we can concentrate on using the application rather than on the mechanics involved in doing things.
The GUI for smart garbage management system proposed by authors is developed using MATLAB software and discussed in this section. In this paper, GUI is used to display different parameters and information regarding the garbage and garbage collection viz. location of dustbin, status of the dustbin, date & time of garbage collection

GUI will be used in the interface and these widgets tracking the level of dustbin filled will be put in the location exactly the way dustbins are placed every part of the city. This will help the garbage monitoring to keep a track of dustbin filled in exact location. Thus our application will help the garbage monitoring to keep a check or track on every dustbin throughout city. It will help him taking accurate decision and avoid the overflow of dustbins and use the resources more efficiently.

6. CONCLUSIONS

This implementation of Smart Garbage collection bin using IoT, IR sensor, microcontroller and GUI . This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor.

This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanness in the society. Therefore, the smart garbage management system makes the garbage collection more efficient the use of solar panels in such systems may reduce the energy consumption. Such systems are vulnerable to plundering of components in the system in different ways which needs to be worked on.
These dust bin model can be applied to any of the smart cities around the world. A waste collecting and monitoring team which is deployed for collection of garbage from the city can be guided in a well manner for collection.

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