

Garbage Disposal Unit in Smart City

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ABSTRACT

The management of municipal solid waste is a complex problem for most developed countries. As the name suggests we are developing an Automatic garbage collection based on GSM module. At present, only a few small cities have implemented procedures for collecting garbage in an innovative way. 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. Bin management is one of the major applications of IOT. Here IR sensors are connected to the bins. It senses the level of garbage in bin. When it reaches threshold level a controller sends a message with the help of a GSM module to the concerned person or municipal corporation authority to clean it as soon as possible.

Keywords: Internet of Things; GSM module; Smart Cities; Bin Management; Smart Environments; object sensing; Solid waste.

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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[1]. It is even estimated that 47 million tons of waste is generated in the year 2011. 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 huge garbage. Issues with respect to the disposal has become challenging with growth in population. Poor garbage collection and the 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 this "Garbage Disposal Unit using IOT" can be used.

This unit combines of ARM7 microcontroller as the main interfacing device to interface with all other components such as motor drivers, IR sensors, relays etc. Heater supplies the heat to the bin continuously so as to convert the wet waste into the dry garbage. Out of the four motors used in the unit one motor performs the function of compression of the garbage while the second one removes the iron materials using the magnet. The other two motors are used for cutting of the garbage and shifting the garbage into the adjacent can placed nearby [2].

Infrared sensor (IR) which is a multipurpose sensor is used to 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 sense any object. Depending on object IR sensors are highly sensitive to surrounding lights. Indian government is struggling to manage the garbage issue with respect to the disposal. Here we are using automatic technique to detect garbage level in garbage can using ID number[3].

II. INTERNET OF THINGS

The Internet of things (IoT) can be defined as connecting the various types of objects like smart phones, personal computer and Tablets to internet, which brings in very newfangled type of communication between things and people and also between things. With the introduction of IoTs, the research and development of home automation are becoming popular in the recent days. Many of the devices are controlled and monitored for helps the human being. Additionally various wireless technologies help in connecting from remote places to improve the intelligence of home environment. An advanced network of IoT is being formed when a human being is in need of connecting with other things. IoTs technology is used to come in with innovative idea and great growth for smart homes to improve the living standards of life.

A. IoT Architecture

The IoT-based architecture provides high-level flexibility at the communication and information. It is an approach which is relevant in many different environments such as patient monitoring system, security, traffic signal control or controlling various applications. The IoT project aims to bring out the various opportunities of using IPv6 and other related standards to overcome the disadvantages using of the Internet of Things. The IoT projects proves a dominant and thorough study of all sensible functionalities, mechanisms and various protocols that can be used for building IoT architectures however interconnections may occur between all totally different IoT applications. As in the networking field, where several solutions emerged at his infancy to leave place to a common model, the TCP/IP protocol suite, the emergence of a common reference model for the IoT domain and the identification of reference architectures can lead to a faster, more focused development and an exponential increase of IoT related solutions. These solutions can provide a strategic advantage to mature economies, as new business models can leverage those technological solutions providing room for economic development.

III. PROPOSED SYSTEM

The key idea of our approach is to extend a processor by a small, low-cost coprocessor dedicated to and specialized for garbage collection, and to integrate them both onto a single device. Each is provided with separate ports to an on-chip memory controller. At its external interface, the device behaves like a standard uniprocessor and interfaces to standard memory devices such as SDRAM.

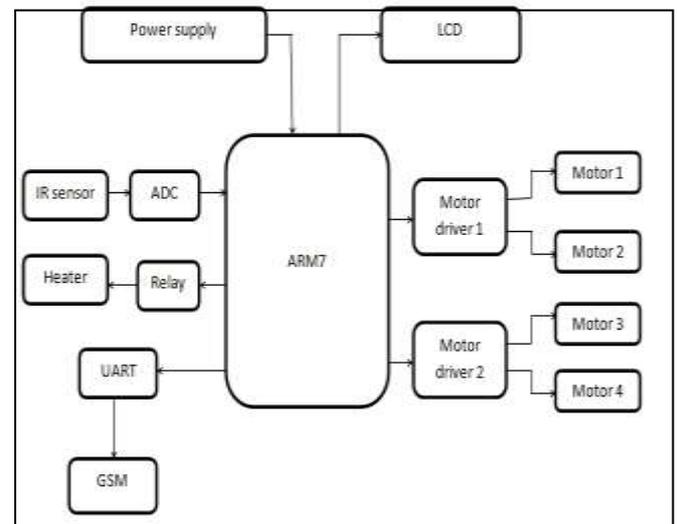


Fig.1. Block Diagram of proposed system

Power supply:

It is mainly used to provide DC voltage to the components on board. It supply 12V for dc motor, 3.3V for ARM7 and 5V for others.

LCD:

LCD is used in a project to visualize the output of the application. We have used 16x2 LCD. So we can write 16 characters in each line. Total 32 characters we can display on 16x2 LCD. LCD can also use in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

MICROCONTROLLER:

It is used to process information that is been given by the sensors. It compares the received data with the threshold level set and accordingly output is generated. The LPC2131/32/34/36 microcontrollers are based on a 16/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with 32 kB, 64 kB, 128 kB, 256 kB and 512 kB of embedded high-speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate.

IR Sensors:

Infrared sensor is used which is a multipurpose sensor which can detect the level of garbage. IR sensors emits the light which is invisible to the naked eyes but the electronic component can detect it. The sensor produces the output a logic 1 at digital output when it senses the object and logic 0 when it doesn't sense any object. Placed below the Garbage Can to sense the weight of it. The LOAD cell will continuously give the weight readings in voltage format, which is then given to a signal conditioning unit which amplifies the voltage and is then give to the μ C. The μ C then converts the analog signal to digital format.

DC Motor:

DC Motors are used to physically drive the application as per the requirement provided in software. To drive a dc motor,

we need a dc motor driver called L293D. This dc motor driver is capable of driving 2 dc motors at a time.

GSM Module:

Global System for mobile communication is used to send message to the garbage depot, if the garbage can exceeds the set threshold level. With the help of GSM Module interfaced, we can send short text messages to the required authorities. GSM Module is provided by sim uses the mobile service provider and send sms to the respective authorities as per programmed. It operates at either the 900 MHz or 1800 MHz frequency band.

IV. SYSTEM OVERVIEW

A major problem with software garbage collectors is their devastating effect on cache locality. During a single garbage collection cycle, they usually examined the entire heap, and, in doing so, repeatedly displace the entire contents of the cache. To resolve this issue, our coprocessor directly connects to the memory controller rather than accessing memory through the main processor's cache[4]. In this way, the cache remains largely unaffected by the garbage collector's activities. To ensure cache coherency, the coprocessor inspects and, if necessary, flushes single cache lines by means of a dedicated cache port that resembles the snoop port of a standard cache. At the end of a garbage collection cycle, the coprocessor invalidates all cache lines that contain dead objects and thereby efficiently eliminates unnecessary memory traffic they would otherwise cause.



Fig.2 Garbage Management

Because of the poor temporal locality of garbage collection algorithms, garbage collection itself will not profit from a cache, and consequently we will be realized that coprocessor without one. However, most garbage collection activities such as scanning and copying objects show a fair amount of special locality. To exploit this property, the coprocessor internally buffers a number of subsequent memory locations and, similar to the main processor's cache controller, takes advantage of efficient burst memory transfers.

V. IMPLEMENTATION METHODOLOGY

Each garbage can is given a number id which is stored in database with its location. A database is created in PC of different set levels which is used to compare with the images that are taken previously by camera. This is done with image processing. This is interfaced with microcontroller with help of RS232 cable. Simultaneously weighing sensor (load cell CZL601) is used. This is a single point load cell of total precision C3 class made up of material i.e. Aluminium alloy. It senses the weight of garbage can. It is interfaced

with microcontroller through ADC[5].

The microcontroller compares the set limit with input data. If anyone or both input data crosses threshold level. Then microcontroller which is interfaced with GSM module sends a message to the server. The sent messages contains the slave id of the garbage can. The server compares the slave id with its database which contains record of slave id and location of each garbage can located in city. Then it gives exact location of the garbage can which is full or over weighted to the driver of waste disposal vehicle.

After receiving the message by the server the waste disposal vehicle reaches to the desired location. Then the driver enters set password with help of keypad in microcontroller. When the set password matches robot mechanism is activated. This robot mechanism is nothing but a machine capable of physical motion, in this project we use dc motor which is fixed on plate on which garbage can is mounted[6]. This plate is used for tilting the garbage can by which garbage is transferred into garbage collecting vehicle.

VI. CONCLUSION AND FUTURESCOPE

Implementation of this project will avoid overflowing of garbage from the container in residential area which is previously either loaded manually or with the help of loaders in traditional trucks. Manual loading takes time and reduces the productivity of the vehicles and manpower deployed. Besides, manual handling of waste poses a threat to the health of the sanitation workers as the waste is highly contaminated. We can use this garbage disposal unit for various purposes like for industrial application by deciding the required power, size of dustbin and the amount of garbage to be thrown into the dustbin. We can generate biogas energy using this technology. By using a suitable technology we can remove the glass materials thus making the unit more efficient.

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