Smart Waste Management Using GSM

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ABSTRACT

Swachh Bharat Abhiyan (English: Clean India Mission and abbreviated as SBA or SBM for "Swachh Bharat Mission") is a national campaign by the Government of India covering 4,041 statutory cities and towns, to clean the streets, roads and infrastructure of the country. The aim of the mission is to cover all the rural and urban areas of the country to present this country as an ideal country before the world. With the proliferation of GSM technology, mobile phones, sensors, cameras it is possible to collect massive amount of garbage and separate the dry and wet dust automatically.

The littering of garbage bins makes serious unhygienic conditions in any type of surroundings. It leads to several health issues. To overcome this problem and make the waste management system more efficient and reliable, we need smart solution like smart waste management and hence that is designed in this project work. In this project, the type of waste (dry or wet) is monitored with the help of sensors (electrodes) and dumps it in appropriate chamber of the dust bin automatically. Microcontroller is interfaced with the GSM modem to transmit message to the concern municipality authorities when any of the dust bin i.e., dry and wet dust bins are completely filled. This will improve the segregation process.

Here a project is proposed to separate the dry waste and wet waste through the electrodes on the dumping plate that dumps the dust bin on either of the directions i.e., left or right where the dry and wet dust bins are placed to collect the dust. This can be useful to categorize the type of waste which is present in the dust bin. The proposed method of categorization is based on sensitivity of the dust material. The copper electrodes operated that are present over the top of the dust bin will identify weather it is dry or wet dust. Depending on this, the dust will separated by dumping it on to either of the side automatically. This information of the wet dust and dry dust full in their respective bins is sensed through the IR sensors that are connected to the arduino controller will be transmitted to the monitoring unit i.e., concern authorities via GSM modem. The project aim is to design an autonomous device that can separate dry and wet waste and alert the concern department automatically when any of the bins is full.

The microcontroller through DC motor will either rotate clockwise or anti-clockwise judging whether the dust is dry or wet. These electrodes provide the signal to the controller whether the dust is dry or wet. Depending on this, if the dust is dry it will be dumped to one side and if dust is found to be wet, it will be dumped to the other side automatically. A total of two sets of IR sensors for the dry and wet bins and a DC motor to dump the dust in the chamber are used in the project work. The controller allows dynamic and faster control along with the electro mechanical devices for the movement. This project uses regulated 5V, 500mA power supply. 7805 and 7812 three terminal voltage regulators are used for voltage regulation. Full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

INTRODUCTION

Waste management is one of the primary problem that the world faces irrespective of the case of developed or developing country. The key issue in the waste management is that the garbage bins at public places are dumped with wet and dry wastes in the same bin. It in turn leads to various hazards such as bad odor & ugliness to that place which may be the root cause for spread of various diseases. To avoid all such hazardous scenario and maintain public cleanliness and health this work is mounted on a smart garbage system. The main theme of the work is to develop a smart intelligent garbage management. This concept proposes a smart alert system for garbage by separating the dry and wet garbage automatically. This process is aided by the IR sensors which are interfaced with arduino microcontroller to check the garbage/dust is dry or wet and dump it in any of the direction for separation of dry or wet dust. After separation, if the individual dry or wet dust bins are full, the information will be transmitted in the form of SMS to the monitoring station or concern department through GSM modem interfaced to the controller.

One of the main concerns with our environment has been solid waste management which impacts the health and environment of our society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies. This is a method in which waste management is automated. This is a GSM based Garbage Monitoring system, an innovative way that will help to keep the cities clean and healthy. The whole process is upheld by an embedded module integrated with GSM module. In the project work, the garbage bins are sensed through the optical (IR) sensors.

The ultimate need of the hour for a developing nation is the key for "Smart City". The influential ecological factors that pose to be a threat to this may include: hazardous pollution and its subsequent effects on health of humanity, alarming global warming and depletion of ozone layer etc. Mostly Environmental pollution may be owing to the Municipal Solid Leftovers. A Proper maintenance becomes mandatory for an efficient and effective removal of the generated Municipal Solid Leftover. It is perceived that often the waste space gets too much occupied due to irregular removal of garbage occupancy in the dustbin.

This exposition proposes an e-monitoring system that put forths an embedded system and sensors based software assimilated with GSM technology. Using the anticipated system, monitoring of the dry and wet waste could be monitored effectively. This design designates a technique in which the garbage type could be checked and separated automatically.

The system is designed with ATMEGA 328 microcontroller, which senses the garbage type (dry/wet) and separates them automatically. Today microcontrollers are playing major role, almost in all activities. These mini chips acts as mini computers can perform many tasks like, data acquisition, data display, data storage, etc, in addition to these; it can control any mechanical transmission, drives through motors efficiently. These chips are increasingly being used to implement control systems. It is therefore important to understand microcontroller architecture well.

The entire system is designed with microcontroller and it is playing major role in this project work. The microcontroller chips are widely used in embedded systems because of its internal facilities. With the advancement of technology in the field of micro-controllers, all the activities in our day-to-day living have become part of information technology and we find micro-controllers in each and every application. Thus, the trend is directing towards controller based project works. The controller is a low power; higher performance CMOS microcomputer with RAM can be used for multiple functions with this single chip. Its high-density non-

volatile memory compatible with standard instruction set makes it a powerful controller that provides highly flexible and cost effective solution to control applications.

Micro-controller works according to the program written in it. The program is written in such a way, so that the Microcontroller can read and transmit the information. Micro-controllers are "embedded" inside some other device so that they can control the features or actions of the product. Another name for a micro-controller, therefore, is "embedded controller". Micro-controllers are dedicated to one task and run one specific program. The program is stored in ROM (read-only memory) and generally does not change. Micro-controllers are often low-power devices. A battery-operated Microcontroller might consume 50 milli watts. A micro-controller has a dedicated input device and often (but not always) has a small LED or LCD display for output. A micro-controller also takes input from the device it is controlling and controls the device by sending signals to different components in the device. The detailed description about microcontrollers is provided in the next chapters. Microcontrollers these days are silent workers in many apparatus, ranging from the washing machine to the video recorder. Nearly all of these controllers are mask programmed and therefore are of very little use for applications that require the programs to be changed during the course of execution. Even if the programs could be altered, the information necessary to do so an instruction set, an assembler language and description for the basic hardware is either very difficult to obtain or are in adequate when it came to the issue of accessibility. This microcontroller has features that seem to make it more accessible than any other single chip microcontroller with a reasonable price tag.

The purpose of this project work is to present control theory that is relevant to the analysis and design of Micro-controller system with an emphasis on basic concept and ideas. It is assumed that a Microcontroller with reasonable software is available for computations and simulations so that many tedious details can be left to the Microcontroller. The control system design is also carried out up to the stage of implementation in the form of controller programs in assembly language. Micro-controllers are "embedded" inside some other device so that they can control the features or actions of the product. Another name for a micro-controller, therefore, is "embedded controller". Micro-controllers are dedicated to one task and run one specific program. The program is stored in ROM (read-only memory) and generally does not change. Micro-controllers are often low-power devices. A battery-operated Microcontroller might consume 50 milli watts. A micro-controller has a dedicated input.

HARDWARE DETAILS

The IC's and other important components used in this project work, procured from the Hyderabad Electronics Market. The details or data sheets of the IC's are down loaded from the Internet. The following are the web sites that can be browsed for collecting the data sheets.
1. www. Texas Instruments.com
2. www. National semiconductors.com
3. www. Fairchild semiconductors.com

The following are the components used in the project work:
1. Arduino uno ATMEGA 328 Controller board
2. LM 567 Tone decoder
3. GSM module
4. H- Bridge L293D
5. Limit Switch

6.Voltage Regulators (7805 & 7812)
7.BC 547 NPN Transistor

The required PCB'S (Printed Circuit boards) for the project work fabricated by SUN RISE CIRCUITS, Kushaiguda Industrial Estate, Hyderabad. Kushaiguda Industrial Estate is very famous for fabricating the Industrial grade PCB's.

CONCLUSION

The project work Titled **"Smart Dustbin Management"** is successfully designed & developed, and a demo unit is fabricated and the results are found to be satisfactory. While designing and developing this proto type module, we have consulted few experts those who are having knowledge in appropriate fields, these professionals working at different organizations belong to Hyderabad helped us while designing the project work.

In this project, an integrated system of GSM modem, IR Sensors is introduced for efficient and economic garbage collection. The developed system provides improved database for garbage collection and waste amount at each location. We analyzed the solutions currently available for the implementation of current technologies. By implementing this project we will effectively be able to separate the dry and wet garbage for clean environment. The technologies which are used in the proposed system are good enough to ensure the practical and perfect for solid garbage collection process monitoring and management for green environment.

REFERENCES:
The following are the references made during the development of this project work.

Text Books:

1.Linear Integrated Circuits – By: **D. Roy Choudhury, Shail Jain**
2.Digital Electronics. By **JOSEPH J.CARR**
3.Fundamental of Radio Communication: By **A.SHEINGOLD**
4.Digital and Analog Communication System By: **K. sam Shanmugam**
5.The concepts and Features of Micro-controllers - By: **Raj Kamal**
6.The 8051 Micro-controller Architecture, programming & Applications - By: **Kenneth J. Ayala**
7.Programming and Customizing the 8051 Micro-controller - By**: Myke Predko**
8.Electronic Circuit guide book – Sensors – By **JOSEPH J.CARR**

Catalogs:

(1) TEXAS   - LINEAR IC's manual

(2) SIGNETICS - DIGITAL IC's manual