

IoT based waste management using Microcontroller

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ABSTRACT

Digital technology is evolving continuously for the past two decades and its impact on our lives is getting stronger and stronger. With the advent of smart phones, one can access every corner of the world with the fingertips. Over 46% of the global population is connected to the internet and this number is estimated to rise to 70% by the end of 2017. With rapidly growing technology, scientists and visionaries across the globe envision a world made simpler with the use of the internet, thus giving birth to the concept of smart waste management. Internet of Things is the upcoming era where all the things we use in our everyday life are connected to the internet. Smart TVs, Air Conditioners, Refrigerators and inventories have already stepped into the market. Today time has come where even waste from industries and houses are being managed by smart phones and internet in home. Our project tries to contribute to waste management and the Internet of Things. In this project, we intend to employ the concept of waste management with the use of internet. The use of sensors that detect the prevailing conditions inside the dust collectors. All these sensors are connected to Arduino Yun which continuously processes the output of each sensor in the program written through Google Application program interface (API)s. This is used as feedback to control the waste collector. This project aims at making life simpler. The same concept can also be used for garbage system. It can also be used for generation of power to an extent from domestic waste and can also contribute to smart city technologies.

Keywords: Internet of things, smart bins, technology, digital, smart city, generation, domestic waste, management.

I. INTRODUCTION

This chapter provides an introduction to the basics concepts that need to be learnt before understanding this project. Basics of Internet of Things, Smart city and Smart bin.

Internet of Things (IOT):

It is an advanced method of connecting things with the use of internet. It can be described as connecting everyday objects like smart phones, TVs, refrigerators, air conditioners, home appliances, special sensors and actuators to the Internet, where these devices are intelligently linked, monitored and

controlled, thus enabling new forms of communication between things and users, and also between things themselves.

Smart city:

A smart city is an urban development vision to integrate information and communication technology (ICT) and Internet of things (IOT) technology in a secure fashion to manage a city's assets. These assets include local departments' information systems, schools, libraries, transportation systems, hospitals, power plants, water supply networks, waste management, law enforcement, and other community services.

Smart dustbin:

Cleanliness is next to godliness is said and believed from the centuries. In this era of environmental concern individuals are outwardly interested in the healthy state of their surroundings. Whether it may a small home of four members or locality cleanliness is of equal importance. India being a huge and highly populated nation, effective waste management is the major concern in maintaining the health and hygiene of the people. Convectional waste management systems which are currently employed in India have static routes and schedules where garbage from containers are collected on fixed schedules, regardless if they are full or not. This type of situation is often seen where dustbin is not addressed even if it is filled and garbage is spread on open streets. This severely affects the health and hygiene of the people.

II. OBJECTIVES

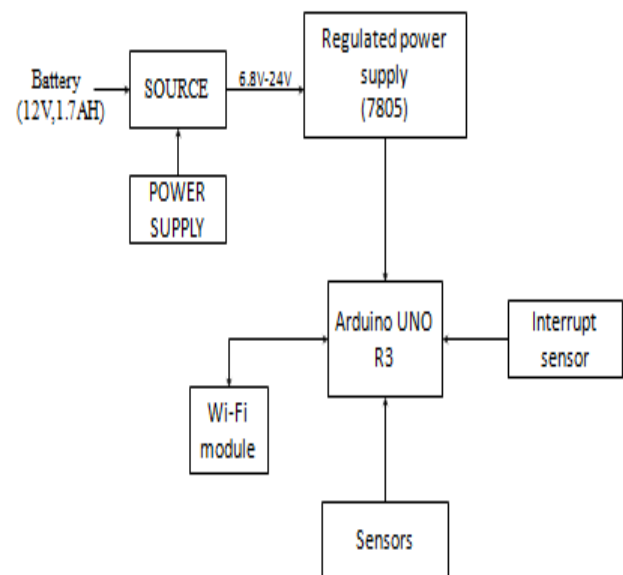
- The proposed system would be able to automate the solid waste monitoring process and management of the overall collection process using IOT (Internet of Things).
- In the proposed system the major concepts we are using on Basics of Internet of Things, Smart city and Smart bins.
- In this proposed system, whenever the waste bin gets filled this is acknowledged by placing ZigBee at the waste bin, which transmits it to the receiver at the desired place in the area or spot.
- In the proposed system, the received signal indicates the waste bin status at the monitoring and controlling system.

III. METHODOLOGY

In this project methodology model takes place the fundamental process activities of the current undergoing project plan, specification, analysis, design development, Validation and evolution which

represent them as separate process phases. In the smart dust bin hardware contains Arduino Uno board, sensors (MQ2), Moisture sensor, Interrupt sensor, WI-FI module, and Regulated power supply. In the smart dustbin, the sensors will continuously monitor the status of the bin. If the bin reaches more than certain level, the level sensors will trigger the message to the concerned authority. If the bin reaches more than certain level, the weight sensors will trigger the message to the respected persons. Also when certain threshold level is reached, the level sensors trigger the message for the authority.

IV. BLOCK DIAGRAM



V. WORKING

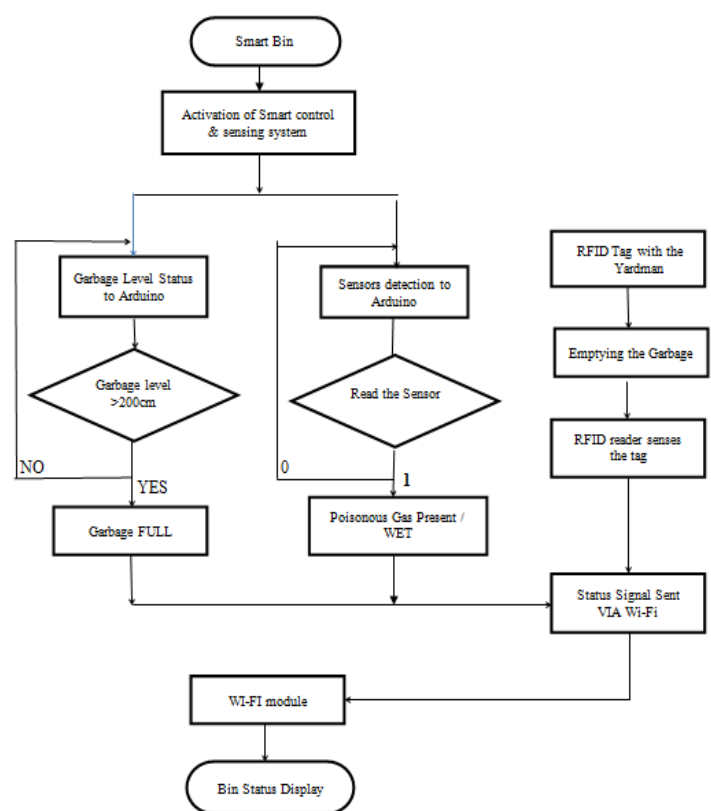
In the traditional approach, a number of trucks from the municipal authority are sent to the waste bins to collect the Municipal waste (MW). The wastes are loaded in the truck and then transported and transferred to the pre-specified locality. However the group of the people involved in collecting and transporting the wastes are usually not responsible enough to make the job well done. It is recommended to power the board via the micro USB connection with 5Vdc. If power in the board through the Vin pin, one must supply a regulated 5V DC.

There is no on-board voltage regulator for higher voltages, which will damage the board.

The input voltage to the Arduino board. Unlike other Arduino boards, if you are going to provide power to the board through this pin, we must provide a regulated 5V. The constant 5v power supply used to power the microcontrollers and other components on the board. This can come either from VIN or be supplied by USB. We placed three sensors in the smart bin .they are, IR sensors, Humidity sensors and gas sensors to measure the status of bin. This process is aided by the ultrasonic sensor which is interfaced with Arduino UNO to check the level of garbage filled in the dustbin and sends the alert to the municipal web server once if garbage is filled. In this each dustbin is given a unique ID for easy identification. We continually monitor all dustbin in our system through an internet connection, and also monitor all the events in the system. In this system many number of dustbins are connected through the internet. The ultrasonic sensor is connected to detect the level of dustbin. The dustbin is divided into three level. The Ultrasonic sensor detect the level of the dustbin and send it to the RF transmitter. Arduino Mega will be programmed to perform the task to measure via sensor and give output. Arduino Mega will be connected to Internet and it will be logged onto the server through the Ethernet shield is configured as the server and will send the commands to the Arduino Mega to monitor all events. This information is then given to the web using internet. This will display the level of all dustbin and display the ID of dustbin which is full. It will also indicate the presence of Toxic gases in the dustbin. If any large quantity of moisture content present in the dustbin it gives message to the concerned authority. The processor transmit the bin filling alert, Humidity alert and toxic gas alert to the Municipal Corporation via SMS intimation. In major cities the waste gathering vehicle visit the population of the particular area and sometimes these dustbins may not be full. Informing the status of each and every dust bin in real time to the concerned authority can send the garbage collection vehicle only when the

dustbin is full. The status of the bin is continuously monitored at the control station to provide a user interaction with the system. The values stored in the database helps a user to have the updated status of the data in the bin as well as the previous values of the parameters of the bin. This collected data from the bin can be used in the optimization of routes for the collection trucks for efficient use of resources in the waste management system.

VI. FLOW CHART



VII. RESULT AND DISUSSION

The following are the results which obtained from this work.

- ✓ Waste Level detection inside the dustbin
- ✓ Transmit the information wirelessly to concerned authority.
- ✓ The data can be accessed anytime and from anywhere
- ✓ The real-time data transmission and access

- ✓ Avoids the overflows of Dustbins This IOT based waste management is very useful for smart cities in different aspects.

We have seen that, in cities there are different dustbins located in the different areas, dustbins are over flown many times, and the concerned people do not get information about this. Our system is designed to solve this issue and will provide complete details of the dustbin located in the different areas throughout the city. The concerned authority can access the information from anywhere and anytime to get the details. Accordingly they can take the decision on this immediately.

VIII. CONCLUSION

The advantages, applications and feasibility of this project in real time application is discussed in this chapter. Smart dustbins are the future. Many private companies and government projects have already started working on creating the next generation smart dustbins. All conventional or traditional dustbins and waste management method are being redesigned to act as smart dustbins. Water proof sensors and microcontroller boards are gaining importance because of their application in the waste management system. Pressure, humidity and temperature sensitive electronics devices are also becoming popular. The next phase of the technological evolution in the waste management system would be the development of a master control unit that monitors and controls the entire city waste management dustbins. Though there are several ways to implement the waste management, monitoring the dustbins through the internet is highly powerful. With the latest technological advancements in the field of cloud technology and fast internet facility the IOT based waste management technology is future-proof. Since a large portion of the population is already using smart phones, laptops and the internet, this technology does not face any barrier to go to market. In this project, a complete working prototype of an Internet

of Things based waste management has been developed. The prototype developed can be used to provide government sectors the access to monitor waste dustbins remotely using a smart phone or a computer through internet. A dedicated web page has also been developed to provide easy access to the users to their smart dustbins. In future sensors and Arduino boards can also be protected from emergency like fire because of the chemical reaction taking place in the dustbins due to bio waste in the dustbins.

IX. FUTURE SCOPE

- The main aim of this project is to make the waste management simpler. The same concept can also be used for savage system. This project is already in implementable stage.
- A few minor improvements from the end user point of view and addition of a few more features to this project can make it an excellent product in today's market to use in all the private sectors and in public places

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