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Optimizing Routine Collection Efficiency in IOT based Garbage Collection Monitoring System

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***Abstract*— This project IOT Based Garbage Collection Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of microcontroller, LCD screen, Wi-Fi modem for sending data and a buzzer. The LCD screen is used to display the status of the level of garbage collected in the bins. Whereas web page is built to show the status to the user monitoring it. The web page gives a graphical view of the garbage bins and highlights the garbage collected in color in order to show the level of garbage collected.**

Keywords*— *Ultrasonic sensor,Buzzer,Led,Wifi module,

INTRODUCTION

1.1 Embedded Systems:

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are microprocessors and micro-controllers. An embedded system is a computer system designed to perform one or more dedicated functions often with real-time computing constraints. It is embedded as a part of a complete device often including hardware and mechanical parts. By contrast ,a general-purpose computer ,such as personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices which are in common use today. The architecture of embedded system is as shown in figure.

DESCRIPTION OF THE PROJECT

This project IOT based garbage collection and monitoring system is a very new system that helps to make the city clean. Through the help of web page the capacity of squander gathered in the bin can be intimated easily to the administration. Ultrasonic sensors are situated inside the bins to locate the trash stage and balance it with the trash bins intensity in this system. Arduino microcontroller, Wi-Fi modem for sending data and buzzers are used for the regulation of this system. The system is motorized by a 12V transformer. The user can check the position of waste using webpage. A picture view of the trash bins are given by the webpage and highlights the junk collected in color in order to show the stage of trash collected. The buzzer is ON when the capacity of squander collected crosses the limit. This system helps to keep the city clean by intimating about the garbage levels of the bins by providing graphical image of the bins through IOT web development platform.

In this design, the hardware components that we use are:

- WIFI MODULE
- TRANSFORMER
- BUZZER
- ULTRASONIC SENSOR

2.1 WIFI MODULE:

The ESP8266 Wi Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Au rdino device and get about as much Wi Fi-ability as a Wi-Fi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

2.2 TRANSFORMER:

LPC2148 works on 3.3 V power supply. LM 117 can be used for generating 3.3 V supply. However, basic peripherals like LCD, ULN 2003 (Motor Driver IC) etc. works on 5V. So AC mains supply is converted into 5V using below mentioned circuit and after that LM 117 is used to convert 5V into 3.3V. It is used to step down 230V AC to 9V AC supply and provides isolation between power grids and circuit.

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SS2.3 BUZZER:

A **buzzer** is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beep sound, the other

type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customised with help of other circuits to fit easily in our application.

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or

+6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

2.4 ULTRASONIC SENSOR:

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is **D = ½ T x C** (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). For example, if a scientist set up an ultrasonic sensor aimed at a box and it took 0.025 seconds for the sound to bounce back, the distance between the ultrasonic sensor and the box would be:

= 0.5 x 0.025 x 343

or about 4.2875 meters.

SOFTWARE REQUIRED

3.1 ***KEIL Micro vision IDE for Programming:***

Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors. I.E the programs written in one of the HLL like 'C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer). For example compilers for Dos platform is different from the Compilers for UNIX platform. The advantage of interpreters is that they can execute a program immediately. Secondly programs produced by compilers run much faster than the same programs executed by an interpreter. However compilers require some time before an executable program emerges. Now as compilers translate source code into object code, which is unique for each type of computer, many compilers are available for the same language.

3.2 ***PROTEUS:***

The **Proteus** is an electronic circuit design software which includes a schematic capture, simulation and PCB (Printed Circuit Board) Layout modules. But generally now a days **Eagle CAD** is highly preferred over Proteus for PCB designing because of its flexibility. Even though if u are not using for PCB designing u can view the PCB layout of the component individually while selecting the component it helps during the soldering of components in PCB. Proteus is ahead in simulating the circuits containing the micro controllers where we can simulate the circuit by uploading the hex code to the Micro-controller where as Multisim can't do this

DESIGN OF THE SYSTEM

In Garbage Monitoring System, Garbage may consist of the discarded substance left over the urban, public area, Society, College, home etc. This paper is related to the "Smart City" and based on "Internet of Things" (IOT). Cleanliness is must in a smart lifestyle, and cleanliness begins with Garbage Bin. This paper deals with the minimization of garbage disposal problem. The projected structure is very new and helps the cities to keep clean. The capacity of squander gathered in the waste bins via a web page is informed by this system. To notice the junk quantity the ultrasonic sensors which are positioned inside the bins are used in this proposed system. In the existing system there is no intimation for the dustbin even it is over flown. It is additional time overwhelming task and less effective. This method leads to the depletion of time since transport has to clean whether the dustbin is occupied or drained. More traffic and noise also may be caused. This system needs high cost and will create an un-hygiene environment that may cause diseases and health issues

The IOT which interconnects Human and social network has a specific method and algorithm, it is not only about the human and social network but also the sociality of the device . The monitoring of the entire garbage bin located

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in the city is done using ATMEGA 16A microcontroller. Various waste bins are positioned right through the urban has microcontroller to track the junk..

IR wireless systems are situated along with central system with microcontroller in this projected structure. Sensor at the top of garbage will absorb the various level of garbage inside the bin. These propagate in the air at the velocity of sound. The echo signal bounces back to the sensor when they hit any of the surrounded objects. The multi vibrator which is in ultrasonic sensors are set to the foundation . The intensity of garbage is indicated by the GSM module and the system operation is controlled by arduino.

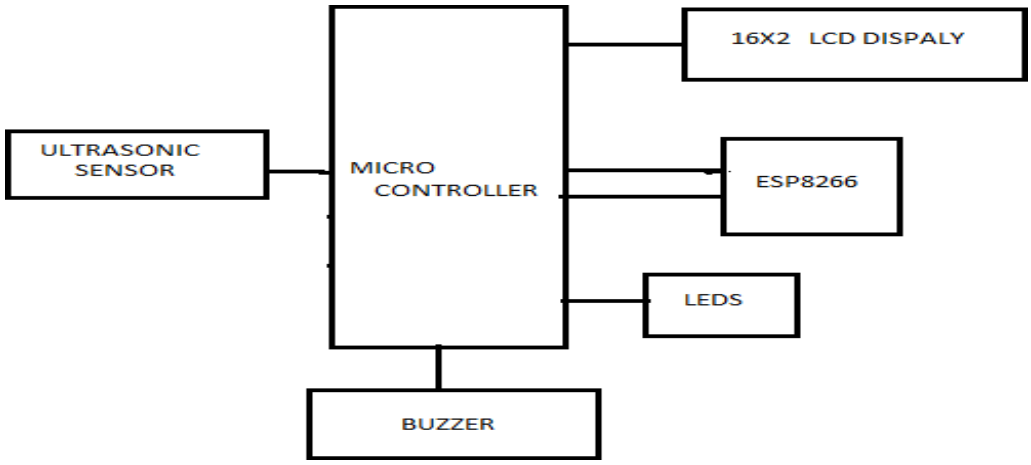

Fig. 1 Block diagram of the system

In this design, the hardware components that we use are:

- ULTRASONIC SENSOR
- LED
- ESP8266
- MICRO CONTOLLER
- WIFI MODULE
- BUZZER

SCHEMATIC DIAGRAM:

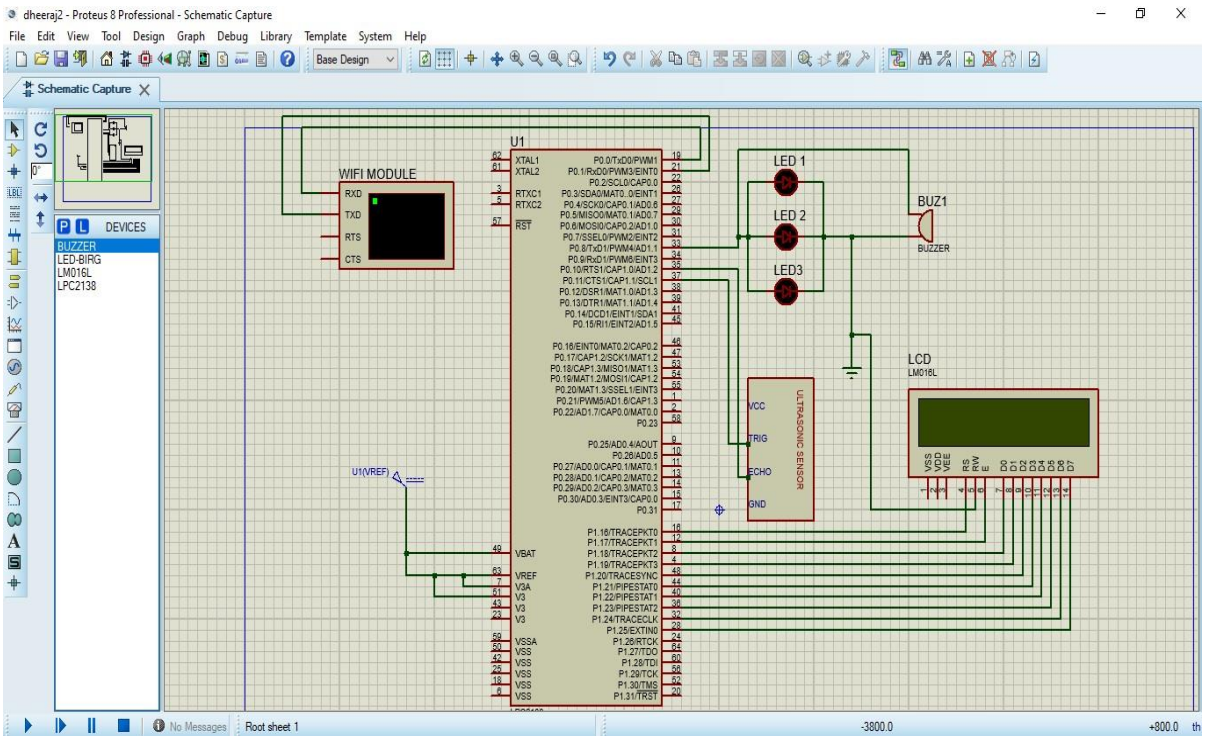

Fig. 2 Schematic diagram

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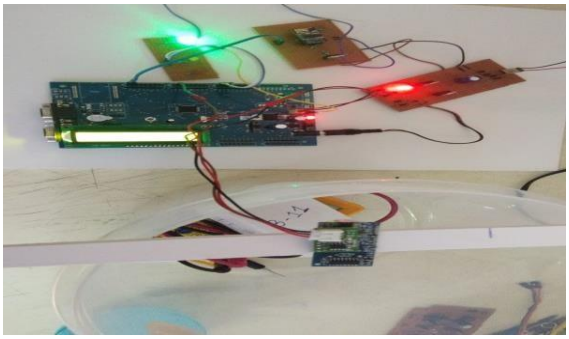
RESULT



ADVANTAGES AND DISADVANTAGES

Advantages

- 1. It saves time and money by using smart waste collection bins and systems equipped with fill level sensors. As smart transport vehicles go only to the filled containers or bins. It reduces infrastructure, operating and maintenance costs by upto 30%.
- It decreases traffic flow and consecutively noise due to less air pollution as result of less waste collection vehicles on the roads. This has become possible due to two way communication between smart dustbins and service operators.

Disadvantages

- System requires more number of waste bins for separate waste collection as per population in the city. This results into high initial cost due to expensive smart dustbins compare to other methods.
- The trainining has to be provided to the people involved in the smart waste management system.

APPLICATIONS

Applications :

- Empowered Swach Bharath Mission.
- Support Digital India.
- It makes our system transparent between Muncipal Corporation, workers and public

CONCLUSION

This project presents the work accomplished on real time solid waste municipal Garbage bins monitoring system. Solid waste can be monitored effectively by sending alert to the local corporation. If the garbage in garbage bin is not cleared in a specific period of time then alert will be sent to the head office so that proper action will be taken accordingly. In this way time can be managed and solid waste can be monitored effectively. So finally it is conclude that the system is so much helpful for monitoring the bins effectively without Over flowing onto the streets.

FUTURE SCOPE

The system provides with the real time information and status of garbage bins located in different areas. With the help of this real time information it can be monitored the bins and once the bins are full the workers can collect the

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garbage and set them to empty again. This system is cost effective and can be accessed from anywhere. Traffic can be controlled as the workers collect the garbage only when the bin is full whereas in traditional way workers collect the garbage daily whether the bin is filled or not. This system has a future scope where this system can be used with time stamp where real-time clock will be made available to the authority stating at what time Garbage bins was full and at what time did the garbage is collected from the smart Garbage Bins.

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