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IOT Based Garbage Monitoring System

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ABSTRACT: The main aim of the project is to process the real time data acquisition under supervisory control for dust-been. In metro cities dust been many times processes goes on, therefore it is essential to monitor all the processes and control the factors affecting them. Adapting a technology like IOT (Internet of things) and GSM (global system modeling) one can achieve the above mentioned objective effectively, and thus record and control is clear than manpower.

KEYWORDS: Arduino , GSM module , Ultrasonic sensor .

I. INTRODUCTION

This project IOT based Dust been 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 SMS. For this the system uses ultrasonic sensors placed over the bean to detect the garbage level and compare it with the garbage bins depth. The system makes use of arduino uno board/ atmega328 microcontrollers, LCD screen, GSM modem for sending data, wifi module to send data over thing speak server. The system is powered by a 12V transformer. The LCD screen is used to display the status of the level of garbage collected in the bean like LOW/ MED/ HIGH, also shows it on status indication LEDs .

Whereas GSM is built to show the status to the user, monitoring it with SMS like levels LOW/ MED/ HIGH. The SMS consists of text, related to garbage beans. The LCD screen shows the status of the garbage level. The system puts on LCD screen continuously monitoring of garbage with arduino board. Thus this system helps to keep the city clean by informing about the garbage levels of the bins by providing SMS to the respective person and monitor it over thing speak server in graphical format.

II. ULTRASONIC SENSOR



Fig. Ultrasonic Sensor

Ultrasonic module has 4 pins i.e. Vcc, Gnd, Trigger, Echo.



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Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work: (1) Using IO trigger for at least 10us high level signal, (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. (3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time×velocity of sound (340M/S) / 2.

HC-SR04 Specifications

- Working Voltage: DC 5V
- Working Current: 15mA
- Working Frequency: 40Hz
- Max Range: 4m
- Min Range: 2cm
- Measuring Angle: 15 degree
- Trigger Input Signal: 10μS TTL pulse
- Echo Output Signal Input TTL lever signal and the range in proportion
- Dimension 45 * 20 * 15m

III. GSM MODEM

GSM (Global System for Mobile communications) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets. It was first deployed in Finland in December 1991

GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and code-division multiple access (CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 megahertz (MHz) or 1,800 MHz frequency band.

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. GSM Modem comes in interfaces like USB, and Serial. GSM Modem is However the main difference is that GSM Modem is wireless, while dial-up modem is wired (telephone previously). GSM is used here to interface with microcontroller and microcontroller command to the GSM modem with AT (abbreviation of Attention) command set implemented in our program.

1) Features of GSM Module:

- Improved spectrum efficiency
- International roaming
- Compatibility with integrated services digital network (ISDN)
- Support for new services.
- SIM phonebook management
- Fixed dialing number (FDN)



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- Real time clock with alarm management
- High-quality speech
- Uses encryption to make phone calls more secure
- Short message service (SMS)

IV. ARDUINO

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control both physically and digitally.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or breadboards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++.

V. WORKING

Here circuit requires 12V, 5V, 3.3V regulated DC supply. We used 230V to 12V-0-12V step down transformer. The output AC of transformer 12V is rectified by center tap rectifier. Rectified output is pulsating it is pure by the capacitor filter of 1000uf 25V. Now the out of capacitor is DC 12V-15V given to the GSM modem, which is required to convert in 5V for other circuit it is regulated for microcontroller and other devices, here we have used LM7805 regulator for getting 5V regulated DC, For LCD display and ultrasonic sensors. And LM317 for 3.3V supply for Wi-Fi module. LED red and LED blue is used to indicate 5V and 12V supply with current limiting resistor of 2.2K and 1K ohm.

MCU (atmega328 microcontroller) works with 16MHz frequency used for (timer configuration), the unwanted frequency produced is bypassed by the capacitor of 27pf capacitor. Reset pin is connected to resistor of 10K whenever reset requires the reset switch (2 lead push to ON switch/ micro push to switch) required pressing.

Atmega328 microcontroller pins 14, 15, 16, 17, 18, 19 are connected to LCD as RS, E, D4, D5, D6, D7 respectively. LCD shows text as our programming conditions.

Ultrasonic sensors are connected with 4 trigger pin and 5 echo pin from ultrasonic. Now depending upon programming condition (by calculating) we can sense ultrasonic sensors with its distance level of garbage.

LED RED connected with pin 25 (to show garbage level is full), LED yellow connected with 24 pin (to show garbage level is medium) and LED green is connected to pin 23 (to show garbage level is low). These LEDs are connected with current limiting resistors of 1K R9 – R11.

GSM modem is connected with 6 and 11 pins as TX and RX pin of GSM to send SMS with AT commands. GSM modem is used to send SMS.

Wifi modem is connected to 12 and 13 pin of microcontroller to TX and Rx pin for Wifi modem ESP8266. It requires 3.3V supply provided with LM317 variable voltage regulator, with 330 ohm and 560 ohm resistors.

Buzzer is just used for notification alert that dust been is full, controlled via 3 pin of microcontroller, transistor is used to driver buzzer to provide proper required current.



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All capacitors of 0.1uf & 100uf connected to reduce unwanted spikes in the circuit, spikes produced by inductive load/sparking contacts of loads. Capacitor of 1000uf/25V at regulator output is connected for the cancel loading effect in the circuit while driving the high current source.

VI. ADVANTAGES AND APPLICATION

ADVANTAGE:

- The circuit required power supply for its operation is very less. (12V, 750mAh)
- We can implement up to 3 dust bins with these used components.
- The circuit is compact in size, so small space is required can be fit in dust bin with SMD components.
- Circuit can send SMS to the stored Mobile number, also we can monitor on thing speak server.

APPLICATIONS:

- It can be used in real time system to detect garbage and send SMS.
- We can implement the whole circuit into small module later, can be implement with solar.
- Less power consuming safety system.

VII. CONCLUSION

Thus our group actively coupled with project, and we develop this project named as “IOT BASED GARBAGE MONITORING SYSTEM”. our group actively coupled with project, and we develop this project named as “ IOT BASED GARBAGE MONITORING SYSTEM”. System can measure garbage level by placing garbage in dustbin using ultrasonic sensor module the system can calculate garbage level and send SMS to the stored mobile numbers in the system.

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