Smart and Innovative Garbage Management System by Using IoT for Clean and Green Nation

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ABSTRACT–This project is to develop innovative garbage management system for clean and green nation. Nowadays the garbage management system works through online complaints registration. But, the action is not taken immediately and it leads to time delay. By introducing smart and innovative garbage management system, an ultrasonic sensor is used to identify the filling limit of garbage, before the garbage overflows. The garbage bin closes by using driver relay to operate motor mechanical setup and a gas sensor gives awareness information through an alarm. If any bad odour is detected at that time also the garbage bin closes. The garbage status notification is sent to the Municipal Corporation through IOT with GPS location and they will clear the problem immediately. The objective and aim of this project is useful for clean and green nation.

KEYWORDS-Arduino UNO, Driver, IOT module, Relay, Motor, GPS, Buzzer, Ultrasonic Sensor, Gas sensor etc..

I.INTRODUCTION

"Swachh Bharat" is a national campaign by the tatutory cities and towns to clean the roads streets and infrastructure of the country. When the massive amount of waste material is collected, it is difficult to separate and unhygienic. Now a day's garbage is separately thrown i.e., dry and wet. The Internet of Things (IoT) shall be able to incorporate transparently and coherently a large number of different and heterogeneous end systems, while providing open access to selected subsets of data for the developing a digital service. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies. One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of the environment also has adverse effects on the health of the society. The detection, monitoring and management of wastes are one of the primary problems of the present period. The traditional way of manually monitoring the wastes in waste bins is a complex, cumbersome process and utilizes more human effort, time and cost which is not compatible with the present-day technologies in any way. This is an advanced method in which waste management is automated. In this "IOT based garbage monitoring and sorting system"

Pollution is the spread of contaminants into an environment that causes instability, disorder, harm or discomfort to the environment. Solid waste management is one of the major environmental problems of India. Solid waste management is the collection, transport, disposal, managing and monitoring of waste material. Garbage may consist of the municipal solid waste construction waste, commercial Garbage may consist of the municipal solid waste construction waste, commercial waste ,industrial waste etc… left over the city. This project is useful for creating "Smart City" and it is based on "Internet of Things". For healthy lifestyle cleanliness is needed and it begins with the use of trash bins. This project will help to eradicate or minimise the solid waste disposal problem. In present scenario, many times we see the garbage bins gets overloaded due to increase in solid waste everyday. It creates unhygienic environment and bad smell in the society and because of this many disease get spread in the society to avoid this situation we are designing "Garbage monitoring system using Internet of Things" In this proposed system the multiple trash bins are located throughout the city, these trash bins are embedded with low cost embedded device. When the dustbin gets half filled that is when the threshold value become 50% then the corporation will get notification and when the garbage level will reach the threshold value 80% then the notification will get half filled. The proposed system is cost effective because it will notify twice to the organization and they will get time to optimise the cost of transportation.

II.LITERATUREREVIEW

1. Prof. R.M.Sahu, Akshay Godase, Pramod Shinde, Reshma Shinde, "Garbage and Street Light Monitoring System Using Internet of Things" INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING, ISSN (Online) 2321 – 2004, Vol. 4,

Issue 4, April 2016:

In this existing system, they have developed an solid waste bin monitoring system garbage bin set the public place then Camera set for garbage bin location. The camera captured image for garbage bin. Radio Frequency Identification (RFID), GPS and GIS send image for work station. The RFID reader and camera are mounted in the truck, when truck come closer to the bin RFID reader communicated RFID tag. & send all information. The System are use controlling Hut. This Controlling Hut are SMS Technology. The GPS and GPRS mapping server to analysing data of various location. The control station compiled all the information and stored in the system database. The bin status and waste truck was monitored.

2. Kanchan Mahajan, Prof.J.S.Chitode, "Waste Bin Monitoring System Using Integrated Technologies", International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) Vol. 3, Issue 7, July 2014:

In this existing system, they have developed waste bin monitoring system using zig bee and Global mobile communication system (GSM). The sensors are place in the common garbage bins placed at the public place when the garbage reaches the level of the sensors. Then that indicated will give in indication to the driver by ARM7 they sending SMS using GSM technology. The technology use by Zig bee, Global mobile system (GSM), ARM 7 Controller. The range of communication of the zig bee is almost 50 meter. They use for range GSM Module, analysing the image we get an idea about level of garbage..The zig bee and GSM system wold be able to monitor the solid waste collection process. This technique overcome some disadvantages which are use of minimum route, low cost, fuel use, clean environment.

III. EXISTING SYSTEM

Waste management system using ZigBee network and MQTT (Message Queue Telemetry Transport) protocol is proposed to determine filled status of the garbage container. The data acquisition module placed within the container updates the server via ZigBee coordinator, whenever the level of the garbage reaches the threshold. MQTT is a lightweight protocol and it provides the communication link between coordinator and the server. Optimal path for collecting the filled containers is determined in the server using Haversine formula and travelling salesman algorithm. The information is intimated to the garbage collection unit through Telegram messaging application to minimize time and fuel cost.

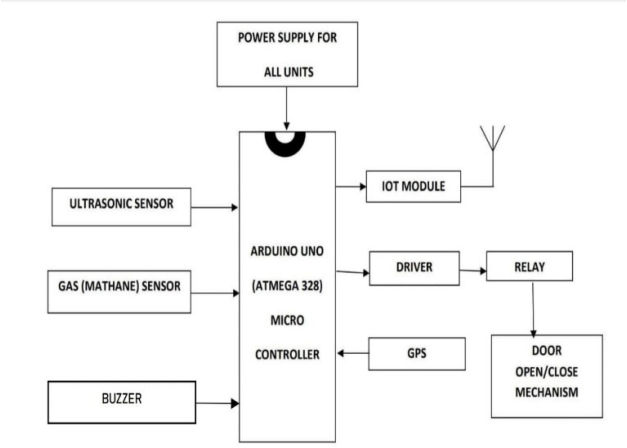
IV. PROPOSED SYSTEM

IOT Garbage Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about gas & the level of garbage collected in the garbage bins via a web page. For this the system uses ultrasonic sensors placed over the bins, it accurately measures garbage levels by comparing them with bin depth and gas sensors detect toxic gases, triggering bin closure for safety. the system promptly alerts the IoT server upon reaching bin capacity or detecting gas leaks, complete with precise location details. The system makes use of arduino microcontroller, IOT modem for sending data. The system is powered by a 12V transformer. whereas a web page is built to show the status to the user monitoring it. Thus, this system helps to keep the city clean by informing about the garbage levels of the bins by providing data of the bins via IOT Blynk web development platform. Alerts are sent to the IoT server when a bin is full or when a gas leakage is detected. This innovative system enhances waste management efficiency and environmental safety, ensuring timely interventions and contributing to cleaner cities.

V. AIM & OBJECTIVE

To maintain the level of cleanliness in the city and form a environment which is better for living. 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.

VI.BLOCK DIAGRAM

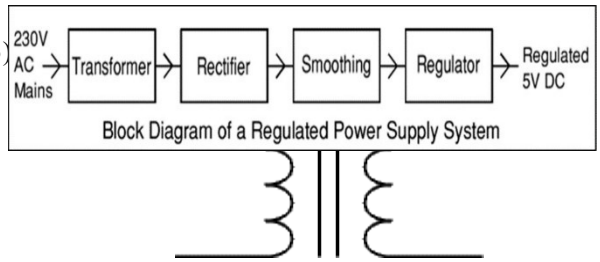


VII. DESCRIPTION OF HARDWARE COMPONENTS

1. POWER SUPPLY: Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex.

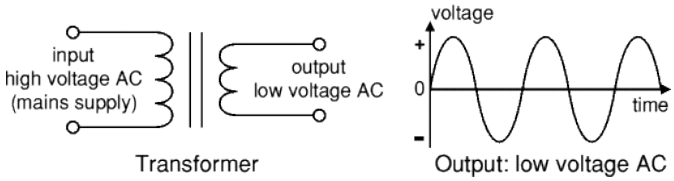
2. Linear Power supply: An AC powered linear power supply usually uses a transformer to convert the voltage from the wall outlet (mains) to a different, usually a lower voltage. If it is used to produce DC, a rectifier is used. A capacitor is used to smooth the pulsating current from the rectifier. Some small periodic deviations from smooth direct current will remain, which is known as ripple. These pulsations occur at a frequency related to the AC power frequency (for example, a multiple of 50 or 60 Hz). he voltage produced by an unregulated power supply will vary depending on the load and on variations in the AC supply voltage. For critical electronics applications a linear regulator will be used to stabilize and adjust the voltage. This regulator will also greatly reduce the ripple and noise in the output direct current. Linear regulators often provide current limiting, protecting the power supply and attached circuit from over current. Adjustable linear power supplies are common laboratory and service shop test equipment, allowing the output voltage to be set over a wide range. For example, a bench power supply used by circuit designers may be adjustable up to 30 volts and up to 5 amperes output. Some can be driven by an external signal, for example, for applications requiring a pulsed output.

3.



Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC.Transformer waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down current is stepped up.The ratio of the number of turns on each coil, called the turn's ratio, determines the ratio of the voltages. A step-down transformer has a large number of turns on its primary (input) coil which is connected to the high voltage mains supply, and a small number of turns on its secondary (output) coil to give a low output voltage.

Turns ratio=Vp/Vs=Nn/Ns and Power out=Power in
Vs*Is=Vp * Ip
Vp = primary (input) voltage
Np = number of turns on primary coil
Ip = primary (input) current

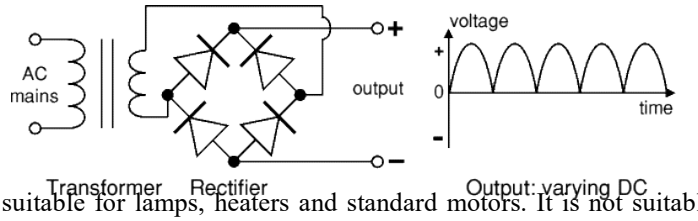


Vs = secondary (output) voltage
Ns = number of turns on secondary coil
Is = secondary (output) current
The low voltage AC output is suitable for lamps, heaters and special AC motors. It is not suitable for electronic circuits unless they include a rectifier and a smoothing capacitor.

4) Rectifier:gg

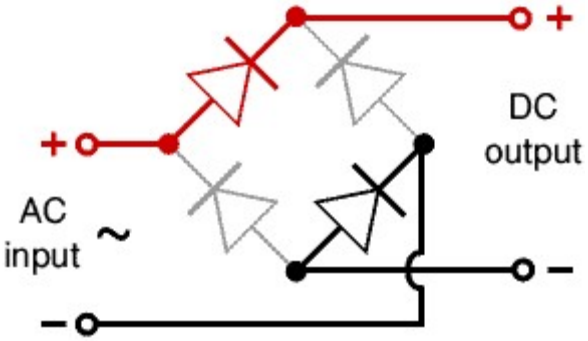
4) Rectifier:There are several ways of connecting diodes to make a rectifier to convert AC to DC. The bridge rectifier is the most important and it produces full-wave varying DC. A full-wave rectifier can also be made from just two diodes if a centre-tap transformer is used, but this method is rarely used now that diodes are cheaper. A single diode can be used as a rectifier but it only uses the positive (+) parts of the AC wave to produce half-wave varying DC.

(Diagram)

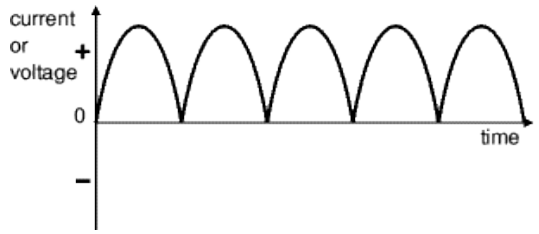


The varying DC output is suitable for lamps, heaters and standard motors. It is not suitable for electronic circuits unless they include a smoothing capacitor.

5) Bridge rectifier:A bridge rectifier can be made using four individual diodes, but it is also available in special packages containing the four diodes required. It is called a full-wave rectifier because it uses the entire AC wave (both positive and negative sections). 1.4V is used up in the bridge rectifier because each diode uses 0.7V when conducting and there are always two diodes conducting, as shown in the diagram below. Bridge rectifiers are rated by the maximum current they can pass and the maximum reverse voltage they can withstand (this must be at least three times the supply RMS voltage so the rectifier can withstand the peak voltages). Please see the Diodes page for more details, including pictures of ridge rectifiers



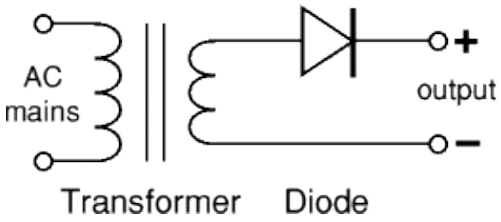
Alternate pairs of diodes conduct, changing over the connections so the alternating directions of AC are converted to the one direction of DC.
Output: full-wave varying DC: (using the entire AC wave).



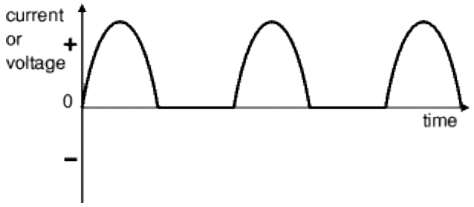
6) Single diode rectifier:

A single diode can be used as a rectifier but this produces half-wave varying DC which has gaps when the AC is negative. It is hard to smooth this sufficiently well to supply electronic circuits unless they require a very small current so the smoothing capacitor does not significantly discharge during the gaps. Please see the Diodes page for some examples of rectifier diodes.

(Diagram)



Output: half-wave varying DC (using only half the AC wave):

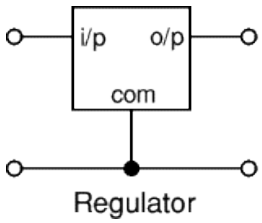


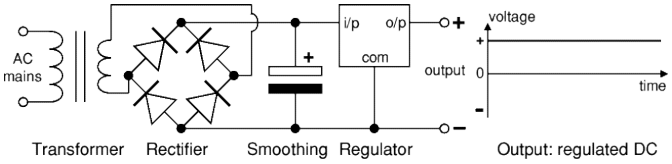
7)Regulator:Voltage regulator ICs are available with fixed (typically 5, 12 and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and overheating ('thermal protection'). The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, HiFi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustable voltages and current.
Many of the fixed voltage regulator ICs has 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the right. They include a hole for attaching a heat sink if necessary.

1.Positive regulator
input pin
ground pin
output pin
It regulates the positive voltage

2.Negative regulator
ground pin

input pin
output pin
It regulate the negative voltage





8) ULTRASONIC SENSOR: Ultrasonic sensor emits ultrasonic pulses, and by measuring the time of ultrasonic pulse reaches the object and back to the transducer. The sonic waves emitted by the transducer are reflected by an object and received back in the transducer. After having emitted the sound waves, the ultrasonic sensor will switch to receive mode. The time elapsed between emitting and receiving is proportional to the distance of the object from the sensor.

The Ultrasonic Sensor is used to measure the distance with high accuracy and stable readings. It can measure distance from 2cm to 400cm or from 1 inch to 13 feet. It emits an ultrasound wave at the frequency of 40KHz in the air and if the object will come in its way then it will bounce back to the sensor. By using that time which it takes to strike the object and comes back, you can calculate the distance. Distance can be measured by equation 1.
Distance = Time * sound speed /2.
Where Time = the time between an ultrasonic wave is received and transmitted. It has four pins. Two are VCC and GND which will be connected to the 5V and the GND of the Arduino while the other two pins are Trig and Echo pins which will be connected to any digital pins of the Arduino. The trig pin will send the signal and the Echo pin will be used to receive the signal. To generate an ultrasound signal, you will have to make the Trig pin high for about 10us which will send a 8 cycle sonic burst at the speed of sound and after striking the object, it will be received by the Echo pin.
Ult Ultrasonic sensors (also known as transducers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

This technology can be used for measuring: wind speed and direction (anemometer), fullness of a tank, and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, sonar, medical ultrasonography, burglar alarms, and non-destructive testing.

Systems typically use a transducer which generates sound waves in the ultrasonic range, above 20,000 hertz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be measured and displayed.

The technology is limited by the shapes of surfaces and the density or consistency of the

material. For example foam on the surface of a fluid in a tank could distort a reading.

4 External links

1.Transducers: An ultrasonic transducer is a device that converts energy into ultrasound, or sound waves above the normal range of human hearing. While technically a dog whistle is an ultrasonic transducer that converts mechanical energy in the form of air pressure into ultrasonic sound waves, the term is more apt to be used to refer to piezoelectric transducers that convert electrical energy into sound. Piezoelectric crystals have the property of changing size when a voltage is applied, thus applying an alternating current (AC) across them causes them to oscillate at very high frequencies, thus producing very high frequency sound waves.

2.Detectors:Since piezoelectric crystal generate a voltage when force is applied to them, the same crystal can be used as an ultrasonic detector. Some systems use separate transmitter and receiver components while others combine both in a single piezoelectric transceiver.

Alternative methods for creating and detecting ultrasound include magnetostriction and capacitive actuation.

CONCLUSION:

Currently waste collection is a major problem faced by the society. Using IOT the waste collection methodology moves to next level. The waste accumulated in the bin directly affects the environment and also affects the people's health. To overcome this problem, this paper provides a practical solution to help the city waste management system. This project is helpful for the nation's "CLEAN INDIA MISION". This project when implemented reduces the human interference and also increases the efficiency of waste collection.

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