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Abstract: In most of the places, the garbage bins are not cleaned at proper time intervals which results in overflowing of garbage resulting in hygiene problems, land pollution; also it creates ugliness to that place. This shows the need for a system that monitors the status of the garbage bin and provides information to the concerned authorities to manage the collection intervals for cleaning the bins. A smart bin is built on a microcontroller based platform Arduino which is interfaced with GSM modem and the required sensor units. Arduino will be programmed in such a way that once the garbage reaches the threshold level the sensor unit will trigger the GSM modem which will continuously alert the required authority. Once these smart bins are implemented on a large scale, by replacing our traditional bins present today, waste can be managed efficiently as it avoids unnecessary lumping of wastes on roadside. Foul smell from these rotten wastes that remain untreated for a long time, due to negligence of authorities and carelessness of public may lead to long term problems.

Keywords: Waste bin, GSM, Arduino.

1. INTRODUCTION

Indian government proposes to create smart cities. For that, the most challenging problem is waste management for municipalities, which are facing serious pollution problem due to the huge quantities of waste. Solid waste management is a big challenge in urban areas for most of the countries throughout the world. An efficient waste management is a prerequisite to maintain a safe and green environment as there are increasing kinds of waste disposal. If solid waste is not handled properly it may create lots many problems related to human health and environment. Therefore, there is a necessity of a system which provides information about filling of garbage level or the bin. So that, municipality can collect the waste from bin before overflowing and helps to maintain the There are many technologies are used for waste collection as well as for well managed recycling. The information gathering is big and cumbersome. The concurrent effects of a fast national growth rate, of a large and dense residential area and a pressing demand for urban environmental protection create a challenging framework for waste management. The complexity of context and procedures is indeed a primary concern of local municipal authorities due to problems related to the collection, transportation and processing of residential solid waste today the garbage collection is manual which takes a lot of efforts and is time consuming.

2. SYSTEM ANALYSIS

2.1 Existing System

In existing system, the remote monitoring of solid waste bin via ZigBee-PRO and GPRS to assist the solid waste management process.

Disadvantages:

ZigBee –PRO can be used for a small range, low cost but gives less efficiency and low performance.

3. PROPOSED SYSTEM

In the proposed system model we use GSM. GSM is now back bone of communication system which is low cost and high performance device and easy to implement. The working of GSM module is to give message signal when the dustbin is 90\% filled. The proposed system is shown in figure 1.

3.1 System design:

\textbf{Arduino Uno}

Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for buildings. Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB.
connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

3.1.2 Ultrasonic sensor:
HC-SR04 ultrasonic sensor shown in figure 3. It uses SONAR to determine the distance of an object just like the bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 400 cm or 1” to 13 feet. The operation is not affected by sunlight or black material, although acoustically, soft materials like cloth can be difficult to detect. It comes complete with ultrasonic transmitter and receiver module.

3.1.3 Temperature and Humidity sensor:
A humidity sensor senses, measures and reports the relative humidity in the air. Humidity / dew sensors use capacitive measurement, which relies on electrical capacitance. A temperature sensor is an electronic device that gathers data concerning the temperature from a source and then converts it into a form that can be displayed and understood by a user or another device. A temperature sensor is often a resistance temperature detector. The temperature sensor is shown in figure 4.

3.1.4 Load sensor:
It is placed below the Garbage bin to sense the weight of it. The LOAD cell will continuously give the weight readings in voltage format, which is then given to a signal conditioning unit which amplifies the voltage and is then give to the microcontroller. A load cell is a transducer that is used to sense and convert a force into an electrical signal. The output of the transducer can be scaled to calculate the force applied to the transducer. The various types of load cells are available, like include hydraulic load cells sensor, pneumatic load cells sensor and strain gauge load cells.

3.1.5 Fire Sensor:
A fire sensor circuit exploits the temperature sensing property of an ordinary signal diode IN34 to detect heat from fire. At the moment it senses heat, a loud alarm stimulating that of Fire Brigade will be produced. The circuit is too sensitive and can detect a rise in temperature of 10 degree or more in its vicinity.

3.1.6 GSM:
GSM (Global System for Mobile Communications, originally (Groupe Spécial Mobile), 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 phones, first deployed in Finland in July 1991.
GSM networks operate in a number of different carrier frequency ranges, with most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Where these bands were already allocated, the 850 MHz and 1900 MHz bands were used instead. In rare cases the 400 and 450 MHz frequency bands are assigned in some countries because they were previously used for first generation system.

4. SOFTWARE USED

Arduino UNO IDE software is used for implementation of the sensor unit. This is an open-source platform used to build electronic projects. A program for Arduino may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution.

The open-source nature of the Arduino project has facilitated the publication of many free software libraries that other developers use to augment their projects.

5. RESULT ANALYSIS

The message is sent from the prototype to a number stored in the memory. The waste bin is found to be filled. Hence the sensor which senses the message to Arduino Uno and from there via GSM is sent to the number. Then the database of the activities of the bin are updated in the Things speak server where in the recent activities or the sudden changes that happens can be viewed in a graphical manner.

Field 1 Chart : Date (vs) amount of dustbin filled(%)  
Field 2 Chart : Date (vs) Temperature(°C)  
Field 3 Chart : Date (vs) Humidity  
Field 4 Chart : Date (vs) Fire
6. CONCLUSION

This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor. We have implemented real time waste management system by using smart dustbins to check the fill level of smart dustbins whether the dustbin are full or not. In this system the information of all smart dustbins can be accessed from anywhere and anytime by the concern person and he/she can take a decision accordingly. It ultimately helps to keep cleanliness in the society.

REFERENCES