A Smart Disinfected Under Ground Trash Collecting and Clearing System

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***Abstract*- In the recent decades, urbanization has increased tremendously. At an equivalent phase there's a rise in waste production. The spillover of waste in civic areas generates the polluted condition within the neighboring areas. it's going to aggravate numerous severe diseases for the nearby people. This may humiliate the appraisal of the affected area. For mitigating the garbage and maintains the cleanness, it requires "smartness based waste management system". This paper is proposed IOT based smart waste clean management system which checks the waste level over the underground dustbins by using sensor systems. Once it detected immediately this technique altered to concern authorized through IOT and also will clean the dustbin to avoid bacterial forming. For this technique used microcontroller as an interface between the sensor system and IOT system. After cleaning the dustbin, the driving force confirms the task of emptying the rubbish with the help of RFID Tag. RFID may be a computing technology that's used for verification process and additionally , it also enhances the smart garbage alert system by providing automatic identification of garbage filled within the dustbin and sends the status of clean-up to the server affirming that the work is completed. the entire process is upheld by an embedded module integrated with RF ID and IOT Facilitation. This is often ensued the greenish within the environment and support for swachhbharat for cleanness.**

***Index terms*- -Monitoring, Arduino UNO, Ultrasonic Sensor, RFID Reader**

I.INTRODUCTION

Recent advancements in communication technology using wireless sensor devices opened vast opportunities for developers and researchers of many intelligent smart systems developed for social relevant applications. Using this everyone is migrating to select only smart mobile phones, smart sensors, smart home automation, smart irrigation system etc. The IoT permits all individuals and things to be more smart and connected to the Internet world. Hence, we can call it as Internet of Everything. To facilitate new smart services and redesign the active devices in smart cities are very effective, when we use IoT [1-6]. In this case garbage collection is reshaped to Waste Collection as a Service. Dynamic scheduling and collecting waste are the manual process, but done efficiently through online using IoT. There are two Issues connected to smart waste collection. First how frequently collect waste from bins and secondly how to inform this to the municipal authorities.

Smart Bin, is a garbage collecting dust bin, which is self-aware and detects the level of the waste in the dustbin, based on that it can send alert messages to the municipal authorities, so the authorities make the arrangements to replace the dustbin. This type of dustbins will be very useful in places where the frequency of people using the dustbin varies because timely checks won't be sufficient [7]. Other features are also added, one is automated closing of the doors with the help of motors using Ultra-sonic Sensor, in case the dustbin is full, another is the detection of objects around the dustbin using IR Sensor, which in turn can help the dustbin from accumulating wastes around the dustbin. An Arduino board is used to send the information to a server. Power supply of 12V-2 Amps is used for the circuit. An IR Sensor is used for detecting objects and an ultra-sonic Sensor is used for detecting the height filled by the dustbin.[8] These Sensors are connected to the SPI Interface of the Arduino, and a buzzer is added with relays. Buzzer is used as an alarm in case people throw wastes around the dustbin. The board also consists of a voltage regulator, which is used to provide the required voltage to the Sensors and the Arduino. [9]. The Arduino consists of an Ethernet module, which is

used for server client communication. Using this, information can be passed from the client to server, and vice versa. This is used for passing info about the current state of the dustbin.

The paper is framed as follows: Section II discusses Literature review in the area of IoT-enabled waste collection for Smart Cities. Section III describes the Problem definition of the system and some scenarios of usage. Section IV considers the scope and motivation for this work. Section V contains the proposed system which describes the complete system model and purpose. Section VI concludes the complete flow chart which describes the process. Implementation and Methodology are proposed in section VII. In section VIII, plans for future work is discussed and finally section IX has conclusion and references.

II. LITERATURE REVIEW

Some of the following garbage typePackaging waste, Agricultural waste, Inorganic waste, Liquid waste etc. In 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. [1]

In 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 would be able to monitor the solid waste collection process. This technique overcomes some disadvantages which are use of minimum route, low cost, fuel use, clean environment. [2]

The waste management is built around several elements. Waste item, domestic bin, trash bags, collective containers and collecting vehicles. The waste flow starts from the waste item and the domestic bin to end in the collecting vehicles. Use the waste identification for sorting process. Base on RFID technology new trash bag is added in a collective container. The technology use Radio Frequency Identification (RFID), Smart vehicular and Trash Bag.They only identify RFID tags garbage bins, Low data speed, high cost. The zig bee and GSM system wold be able to monitor the solid waste collection process. This technique overcomes some disadvantages which are use of minimum route, low cost, fuel use, clean environment. [3] A single directional cylinder is suspended next to the lid of dustbin. The piston is free to move up and down vertically inside the dustbin to a certain level. A plate is attached to the cylinder for compressing the garbage. The shape of this plate depends upon the shape of the dustbin. The compressing plate consists of a side hole through which the leaf switch is suspended upside down. Technology use Piston, Switch, microcontroller, the single directional cylinder, smart dustbin. Only use for smart dustbins, they are not provide garbage collection. Smart Dustbins can prevent the accumulation of the garbage along the roadside to a great extent thereby controlling the widespread of many diseases. It can prevent pollution and also prevent the consumption of the spread out garbage by the street animals. [4]

A laser diode is a p-n junction diode which produces a narrow beam of light that is intense, focused and coherent. In a LASER diode a mirrored resonant chamber is used to reinforce the light waves so that the light emitted by the device is at a single frequency and of the same phase. A photo detector is a device that converts light signals into electrical signals, which can be amplified and processed. Technology use Dustbins, LASER Diode, Photo Detector Diode, Road Side Units (RSU), and Garbage Collecting Vehicle (GCV).Only support for simulation of Transmission Control Protocol (TCP), routing and multicast protocols over wired. The dynamic routing of GCV compared with static solution is much more efficient and will be much effective when more than one dustbin fills up at the

same time. The initial planned route is saved so that when real-time data is received only portion of the planned path may be changed. [5]

For the garbage detection, weight sensor can be used. It gives the weight of the garbage in the dustbin. But it doesn't provide any information about the level of the garbage in the dustbin. Hence author used Infrared (IR) sensor for garbage detection. IR sensor radiates light which is invisible to the human eye because it is at infrared wavelengths, but it can be detected by electronic devices.IR transmitter consists of LED which send the IR beam. Technology use Infra-red sensor (IR), Microcontroller, Global System for Mobile (GSM), graphical user interface (GUI).Infrared sensor (IR), Global System for Mobile (GSM).They only use GSM network. Power and internet supply continue on.Smart garbage management system using IR sensor, microcontroller and GSM module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. [6]

Arduino is best described as a single-board computer that has deliberately been designed to be used by people who are not experts in electronics, en-Gingering, or programming. It is inexpensive, cross-platform (the Arduino software runs on Windows, Mac OS X, and Linux), and easy to program. Both Arduino hardware and software are open source and extensible. Arduino is also powerful: despite its compact size, it has about as much computing muscle as one of the original navigation computers from the Apollo Programmers, designers, do-ityourselves, and artists around the world take advantage of Arduino's power and simplicity to create all sorts of innovative devices, including interactive sensors, artwork, and toys. [7]

III. SYSTEM ARCHITECTURE

The 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 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 Sensory and security module makes use of the on board Arduino, RM-18 RFID Reader and the HC-SR04 Ultrasonic Sensor. The User first scans their respective RFID tag that is issued by the local municipality, the data is then sent to the Arduino to be verified, if the user is valid the Arduino authenticates it and then opens the lid for the dustbin, the user throws the waste and closes the lid of the dustbin, the ultrasonic sensor uses the depth sensing technique and scans how much waste is present in the dustbin, this data is then sent to the data processing module.

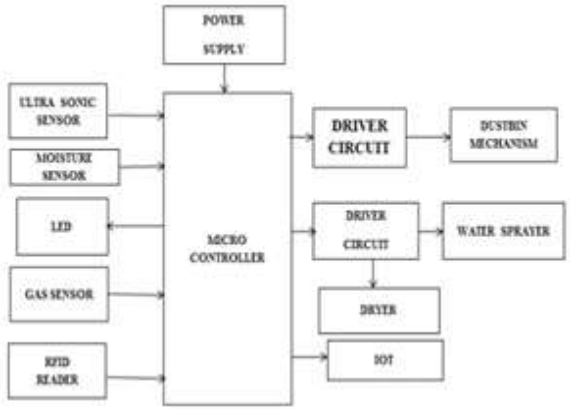

Fig 1: Block Diagram

A. Hardware Requirements:

- Power Supply
- Microcontroller
- Driver Circuit
- Dc Motor
- Led
- Ultarsonic Sensor.
- Fan
- Rfid Reader
- Iot

IV. HARDWARE IMPLEMENTATION

A. Arduino UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is

distributed under Common Creative Attribution Share-Alike 2.5 license and is available on the arduino website. Layout and production files for some versions of the hardware are also available. "UNO" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0.The UNO board and version 1.0 of arduino Software (IDE) were the reference versions of arduino, now evolved to newer releases. The UNO board is the first in a series of USB arduino boards, and the reference model for the arduino platform. The ATmega328P on the arduino UNO comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The UNO also differs from all preceding boards in that it does not use the FTDI USB-toserial driver chip. Instead, it uses the Atmega16U (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

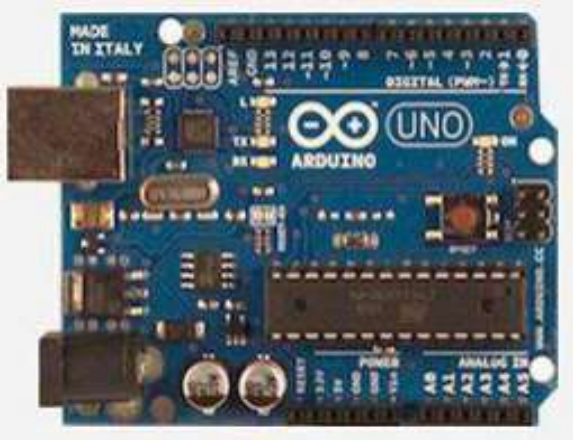

Fig -3: Arduino Board

B. Ultrasonic Sensor

Ultrasonic sensors of module HC-SR04 is used for the purpose of detecting the distance from an object (not being in direct contact with the object) with a very high accuracy. The sensor has a basically four pins, namely VCC, trigger (input), echo (output), and ground. Also, this module has a ranging distance of 2–400 cm. The ultrasonic sensor sends an ultrasonic wave which on reaching an object reflects back to the sensor allowing it to determine the distance between the sensor and the object. The ultrasonic sensor in this paper senses the level of garbage (wet or dry waste). The ultrasonic sensor can also work even if there is a thin layer of coating (dirt) on it

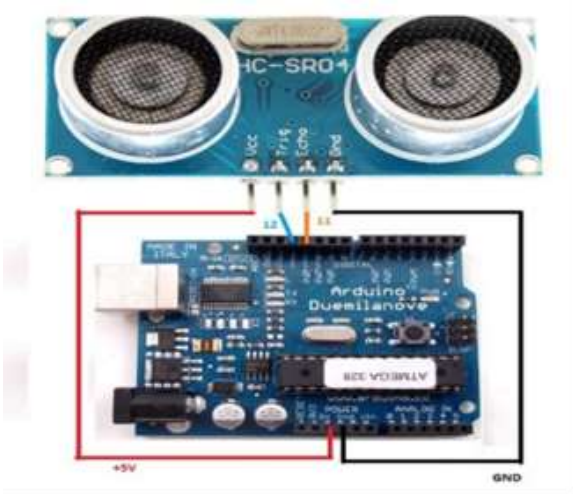

Fig-3:Interfacing Diagram Ultrasonic Sensor With Arudino

C. Gas Sensor

MQ-4 Semiconductor sensor is made using Natural Gas Sensitive material. MQ-4 gas sensor is sensitive to tin dioxide. When the concentration of the tin dioxide increases, the conduction levels of sensor also increases. MQ-4 gas sensor is also sensitive to Methane, Propane and Butane. The sensor is used to sense different burnable gases, mainly Methane. It is low cost sensor and suitable for different application.

Fig 4: MQ-4 Gas sensor

D. DC MOTOR

It converts electrical energy into mechanical energy. It wastes are unloaded periodically. The motor terminals will have a positive and negative polarity and this helps the motor to rotate in clockwise direction. And the motor opens and close the lid of garbage at feasible timings.

Fig-5: Dc motor

E. Status Indicator

Once the user logs in successfully he would be able to access the information like status and location of the bin. Two LEDs green and red will be placed on the bin. When the bin is filled or if the weight of the waste inside the bin exceeds a threshold value then the red LED is lit up. And the green LED is on when the bin is empty. The overall process information is being displayed on the LCD display.

F. RFID TAG

RFID tag is a tiny device that stores and forwards the data to RFID reader. They are characterized in two types – active tag and passive tag. Active tags are contains an inherent internal battery and do not demands power from the reader. Stereotypically active tags have a longer distance range than passive tags. Passive tags are slighter and lighter in dimensions than that of the active tags. They do not contain an inbuilt battery and thus they look upon RFID reader for its operating power and undoubtedly have a lower range limited up to few meters.

G. RFID READER

The radio frequency gets transmitted by the reader when powered ON. When the tag is positioned close to the reader, the RFID tag will collect the radio frequency via the antenna placed inside the tag exclusively. The radio frequency received will be converted into electrical power that is enough for the tag to transmit the data back to the RFID reader. In addition to this, the reader will transmit the tag ID to the external device by a serial communication. A wide range of reader modules are readily available now. The most communal and easy way to use reader is EM-18. This module read the RFID passive tag and shifts the tag ID to the Arduino microcontroller.

H. WI-FI IOT Modem

The WI-FI module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development upfront and minimal loading during runtime. It has a high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces it contains a self-calibrated RF allowing it to work under all operating conditions and requires no external RF parts.

V. RESULTS AND DISCUSSION

Trash Chutes is a waste disposal equipment used mainly for easy and efficient disposable of waste in hi-rise residential buildings. The refuse is received from the successive floor through the inlets located on the vertical system of pipes that convey refuse through it and discharge it into the collecting chamber from where the refuse is cleared at suitable intervals.

A. Working Procedure

Step [1]. If the person coming to clean the waste into the bin RFID card reader read the information stored in the tag.

Step [2]. ultrasonic sensor detects the clear detection of the object and sends the outline representation of object to the local authorities if is there any electrical components present inside the bin.

Step [3]. Gas sensor detects the toxic gases of the garbage present in the bin and with the help of ultrasonic sends the up to date information to the officers .They can monitor the bin if it fills they can squash that bin.

Step [4]. If the bin reaches the maximum level it makes the little noise and some indication will show on the screen of the authorities.

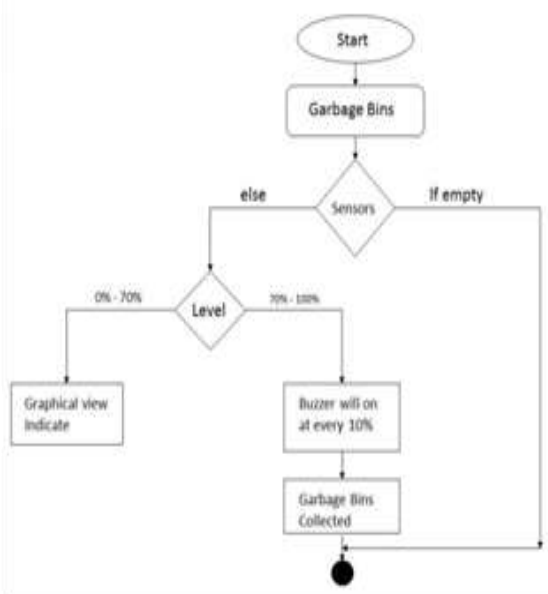

Fig 6:Flow Chart

Fig 7:Experimental Setup

The hardware components should be connected properly. Also ensure that the android phone and the server should be connected to the internet. As soon initially the dustbin is empty LED is on. t. Technology is been used to provide better garbage disposal methods in urban areas. This creates a direct connection where every citizen is doing his part in maintain a clean environment around him.

VI. CONCLUSION

This paper work is the implementation of Automatic smart garbage monitoring system system using Ultrasonic sensor, Arduino Uno, Buzzer and Wi-Fi module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. It will take power supply with the help of Piezoelectric Device. If the dustbin is not cleaned in specific time, then the record is sent to the Sweeper or higher authority who can take appropriate action against the concerned contractor. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimately helps to keep cleanliness in the society. Thus this system comes in handy as an admirable solution in environmental maintenance. In addition to this it also aids to diminish the need for high human intervention in garbage maintenance of the municipality and pollution monitoring system.

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