

IoT based Garbage Monitoring & Water Dispenser System

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Abstract— Now a day's population of India increasing day by day resulting the increase in the garbage in city. With increase in waste creates problem of overflowing of bins which are not cleaned by authority time to time. Also we are facing the problem of viral diseases due to contaminated water. This is the proposed system which withstands this situation. IoT based garbage monitoring and water dispenser system is a system which gives information about the level of the trash bin in the form of graphical view to the municipality and dumping vehicle via webpage. In this system IoT is a backbone of the system. This system is remunerative because when person drops trash into bin he will be remunerated in the form of purified water. When dustbin gets full there is provision of lock system so that overflow of dustbin is avoided. The main motto of this system is to promote Swachh Bharat Abhiyan and Smart City and other schemes run by government of India.

Key words: IoT, Garbage Monitoring, Water Dispenser System

I. INTRODUCTION

The current population of India is 1,347,162,665 based on the latest United Nations estimate. India's population is 17.74% of the total population of the world. It leads to more waste disposal. Existing waste management system is not reliable to manage all the waste in city. Many times trash bins overflow and animals like dogs, cows eat the garbage and get severely affected by it. They may die due to poisoning. Also birds may pluck the garbage out of the bin, this creates bad scene. This bad scene will be avoided by this IOT based garbage monitoring and water dispenser system. Water dispenser system will give present amount of purified water to the user after dropping garbage into bin. This will help us to avoid health issues of human being.

Dustbins are not cleaned regularly by municipality workers. Lots of fuel and energy is wasted in garbage collection. IoT based garbage monitoring and water dispenser system reduces this expenses. The IOT is the network of home appliances, vehicles; other electronic items embedded such that they can connect to each other and exchange their data.

It is also estimated that global market value of IOT will reach \$7.1 trillion by 2020. Experts depicted that IOT will connect about 30 billion of objects together by 2020. These devices will collect data from each other and communicate easily.

In this proposed work, when garbage is collected in bin, it will show graphical view of the dustbin on the webpage. As garbage drops into bin respective amount of water is dispensed by the system if person wants it. When garbage reach its threshold level it will be recognized by ultrasonic sensor which is fitted over the dustbin. This is observed by the work station of municipality on the webpage on which data is sent via Wi-Fi module. The proper action

will be taken by the municipality then. Due to this system monitoring of the garbage bins becomes efficient and time conserving. The proposed work is so reliable that it meets all requirements of Swachh Bharat and smart city campaign which is run by our honourable PM Narendra Damodardas Modi.

II. GOAL OF THE PROPOSED WORK

People should tend to clean their surrounding and help in reducing a pollution and deadly diseases. The proposed system will be able to keep the city clean to do so this system is capable of helping the civilians as well as government authorities.

III. LITERATURE SURVEY

Some of the following garbage type Packaging 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 comes closer to the bin RFID reader communicated RFID tag. & send all information. The System is 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. In waste bin monitoring system using zigbee 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), ARM7 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 zigbee 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. [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 status of level of the litter in the trash bin. Hence in this system Infrared (IR) sensor is used for garbage detection. IR sensor radiates invisible light which can be detected by electronic devices. IR transmitter consists of LED which send the IR beam. Technology use Infra-red sensor, Microcontroller, Global System for Mobile (GSM), graphical user interface (GUI). They only use GSM network. Power and internet supply, Smart garbage management system using IR sensor, microcontroller and GSM module.

IV. SYSTEM ARCHITECTURE

IoT based garbage monitoring and water dispenser system is a very revolutionary concept which will keep our area clean and tidy. This system also avail the purified water to the person who dropped the trash into bin if person wants. This system monitors the litter bins and informs about the level of the bins to the respective authority through webpage. For this purpose the system uses ultrasonic sensors fitted over the waste bins. It detects the level of the litter inside the bins and compare it with height of the bin. As the trash get dropped into bin it will recognized by IR sensor and respective amount of purified water will be dispensed by this system. When dustbin is full it get locked by use of servo motor This system uses pic family microcontroller ,ultrasonic sensor, IR sensor, LCD display, Wi-Fi module, motor driver(L293d),pump. This system is powered by 12v transformer. LCD screen is

used to display the location of next litter bin after first bin is full.

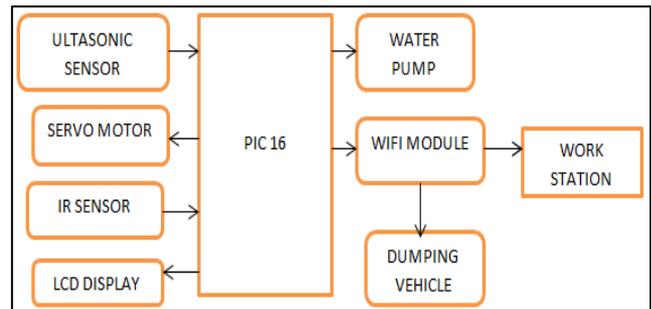


Fig. 1: System Architecture

Whereas the webpage is made to show the graphical view of the litter bins to the user monitoring it. On the webpage there will be coloured graphics showing the level of trash in the bin. The Wi-Fi module will send the message on webpage after the waste bin gets full. Respective action is to be taken by municipality.

V. HARDWARE DESCRIPTION

A. Pic16F877A Microcontroller

It obtain information from sensor and process on it. It compares the received data with the threshold level set and accordingly generate the output. PIC16F874A/877A devices are available in 40 pins and 44 pins packages. The PIC16F87XA devices have a 13-bit program counter capable of addressing an 8K word x 14bit program memory space. The PIC16F876A/877A devices have 8k words x 14 bits of flash program memory, while PIC16F873A/874A devices have 4k words x 14 bits.[5]It contain timers which are useful for calculation of distance of trash in bin.

B. Ultrasonic Sensor (HCSR04)

Ultrasonic sensor will be used to measure the level of litter filled in the bin. The level of litter will be depicted in terms of distance between the sensor and litter in bin. This module has 4 pins- VCC (5V), Trig, Echo and GND. Trig have to be used to send out an ultrasonic high level pulse for at least 10µs and the Echo pin will then automatically detect the returning pulse. Sensor will calculate the time interval between sending the signal and receiving the echo to determine the distance. Working frequency of ultrasonic sensor is 40Hz. Min range is 2cm and max range is 4m and measuring angle is 15 degree.

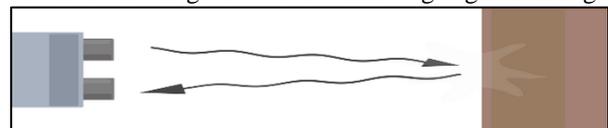


Fig. 2: Ultrasonic sensor

C. Power Supply

System uses 12v power supply. It is mainly used to provide DC voltage to the components on board. 3.3V for Wi-Fi module and 5v for ultrasonic sensor is applied from power supply. 5V is required for IR sensor applied from power supply. Water pump requires 12v of power supply. Servo motor require 6v to operate Pic operates on 5v.

D. LCD

This is used for display purpose in this system. All the changes or required action needs to be taken will flash on this LCD. This LCD is of 16*2 configurations. That means they are having 16 columns and 2 rows. Each row and each column can be individually programmed to display the characters with the help of microcontroller.

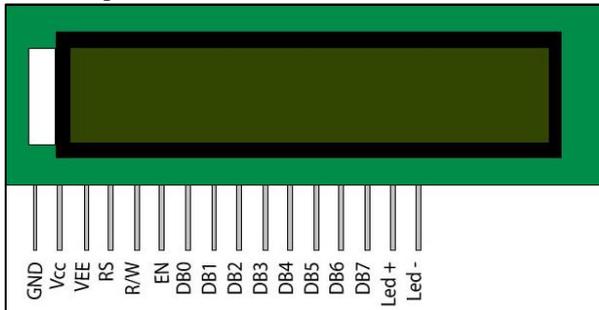


Fig. 3: LCD

E. IR Sensor

When the trash is dropped into bin it is detected by the IR Sensor and water valve will be open. An IR sensor consists of an emitter, detector and associated circuitry. The circuit required to make an IR sensor consists of two parts; the emitter circuit and receiver circuit. Emitter emits the IR light and receiver receives that light. As the ray is transmitted by the transmitter it get reflected by obstacle and corresponding amount of voltage is produced at the terminal. Amount of the voltage is depend upon the intensity of the ray reflected. Its range is about 8cm. [6] this sensor is acting like a switch in this project.

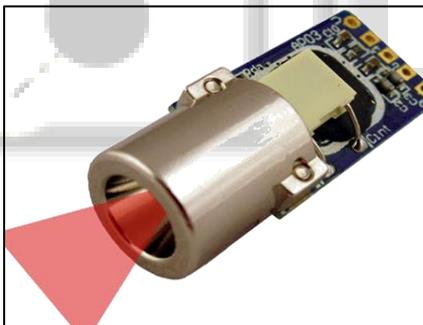


Fig. 4: IR Sensor

F. Wi-Fi Module

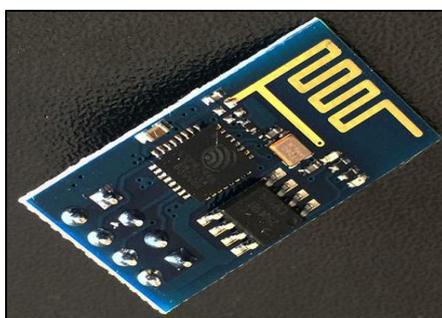


Fig. 5: Wi-Fi Module

ESP8266 is a chip which is wireless network micro-controller module. It has 32 big ten silica MCU (microcontroller unit) with Wi-Fi functionality. It has integrated 10 bit ADC, TCP/IP protocol stack, TR switch, balun, power amplifier,

LNA and matching network. It supports antenna diversity. It wakes up and transmits the packets in less than 2ms time. It generates +20dbm power supply in 802.11b mode. It can operate in the temperature range from -40 degree Celsius to 125 degree Celsius. It has 8 pins and works on 3.3v of power supply. For getting this low voltage system uses voltage regulator IC. By using ESP8266 graphical view of the bin is display on the web page.

G. Motor Driver (L293D)

The L293 and L293D devices are quadruple high –H driver. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltage from 4.5 to 36V. The L293D is designed to provide bidirectional drive currents of up to 600-mA for at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, DC and bipolar stepping motors, as well as other high-current/high-voltage loads in positive- supply applications.

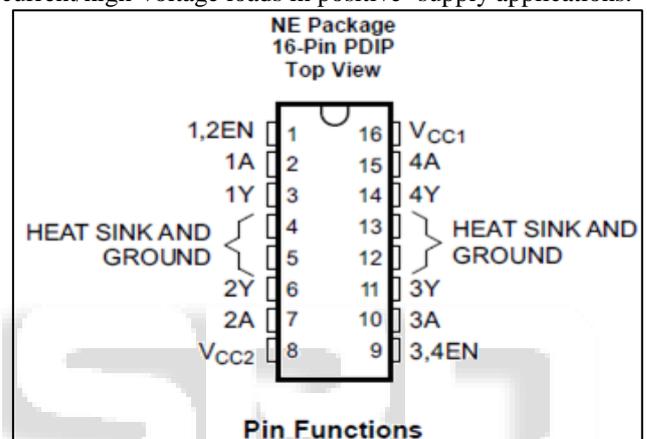


Fig. 6: Driver IC

H. Servo Motor

Servos are controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse, and a repetition rate. A servo motor can usually only turn 90° in either direction for a total of 180° movement. When the dustbin is full it locked by the servo motor.



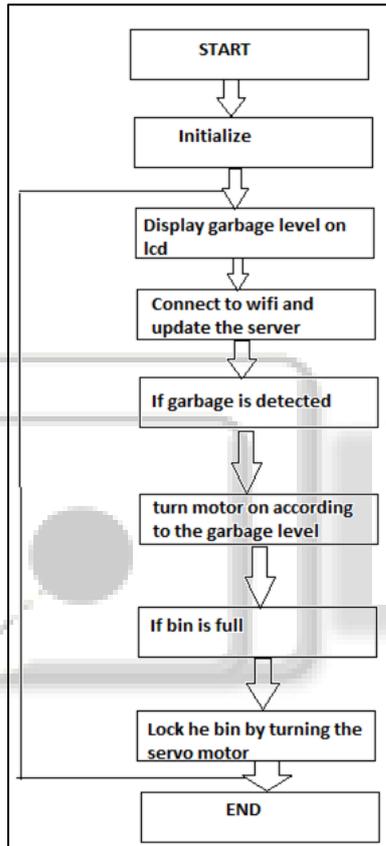
Fig. 7: Servo Motor

Water Dispenser System: When trash is been dropped into the bin IR sensor detects it and send the output to the microcontroller. Then microcontroller sends the signal to the motor. Motor will run for the preset time. It will dispense the required amount of water into container. In this way this system works.



Fig. 8: Water Dispenser System

I. Flowchart



J. Advantages

- It will avoid soil and air pollution.
- It will help better city planning and development.
- It reduces waste of manpower and fuel.
- It provides pure water to user which is good for health.
- Because of this it is also useful to reduce diseases like jaundice, cholera, etc.

K. Application

Smart city can reduce environment pollution. It will enable better services to citizen by managing operations without human interventions. Cities are growing faster contributing to the world population. So it becomes a big challenge to manage garbage. This project will help to make cities smart. By 2020, IOT will connect more than 26 billion devices and trash bins is one of them.

VI. CONCLUSION

As the name suggested IOT based garbage monitoring and water dispenser system will monitor status of garbage bin by using ultrasonic sensor. It will check the level of garbage bin and send message to the webpage through Wi-Fi module. This information on webpage is accessed by Municipal Corporation and trash vehicle and dustbin will be cleaned.

In public places like hill station, railway station. There is a huge amount of waste there. By implementing this proposed work, we can avoid overflow of bin and keep environment clean. When user use trash bin, he get remuneration in the form of purified mineral water. The proposed system carry advantages such as reduced man power, cost, etc. It will help to maintain cities keep clean and provide purified water under the campaign of smart cities and Swachh Bharat by government of India.

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