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Title Automation of Smart Waste Management

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Automation of Smart Waste Management

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Abstract— 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 waste is one of the primary problems of the present era. The process of making the things automatic is being exploited in almost all the major fields of life. Solid waste which is one of the sources and causes of environmental pollution has been defined under Resource Conservation and Recovery Act as any solid, semi-solid liquid or contained gaseous materials discarded from industrial, commercial, mining or agricultural operations and from community activities. we are going to implement a project called IoT Based Smart Garbage and Waste Collection bins. These dustbins are interfaced with microcontroller-based system having ultrasonic sensor systems along with central system showing current status of garbage, on mobile web browser with html page by Wi-Fi. Hence the status will be updated on to the html page. Major part of our project depends upon the working of the Wi-Fi module; essential for its implementation.

Keywords— ESP32, Infrared Sensor, Ultrasonic Sensor

I.

INTRODUCTION

The rising population of India poses serious threats with regard to the availability of living space, Utilization of natural resources and raw materials, education and employment. But another serious peril that follows is the escalating amount of waste generated each minute by an individual. Every city is grappling with the menace of ever increasing waste. An astounding 0.1 Million tons of waste is generated each day in our country. Sadly, only 5% of this colossal amount of waste is recycled. In India, the collection,

transportation and disposal of MSW are unscientific and chaotic [12]. Uncontrolled dumping of waste on outskirts of towns and cities has created overflowing landfills which are not only impossible to reclaim because of the haphazard manner of dumping but also has serious environmental implications. When viewed on a larger scale, the poor recovery rate has impeded the growth of the country as well as the economy of the nation. One possible solution for this problem could be segregating the waste at the disposal level itself. We have thus come up with an Automatic waste segregator that categorizes the waste as wet, dry. This project 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 android app. Admin should monitor the dustbin. There should be send message to worker when garbage is reached to certain threshold. In existing garbage monitoring system, local governments manage garbage by deploying garbage bins and employing multiple pickup businesses for garbage collection [13].

II. OBJECTIVE

Smart waste management is idea where we can control lots of problems which disturbs the society in pollution and diseases. The waste management has to be done instantly else it leads to irregular management which will have adverse effect on nature.

III.

LITERATURE SURVEY

“Intelligent Waste Separator”-This paper proposes a prototype of the Intelligent Waste Separator (IWS) that consists of a common trash can, with more containers inside it, using multimedia technology. People can throw their waste, no matter what kind, into the system. The latter is able to decide what kind of waste it belongs to and to deposit it in the correct container. Garbage is a global problem that affects all living beings [14]. A study from Grow NYC shows that 80% of the world's solid waste is produced in the United States of America. Also, 70% of its trash is used once and 45% is buried or burnt, such waste is paper, plastic, etc.

IV.

DESCRIPTION OF THE PROJECT

A. Proposed System

This is intended with IR sensors and Ultrasonic sensor which is controlled by ESP32. Ultrasonic sensors are used for measuring the waste present in the dustbins. The power supply is given to IR sensors and Ultrasonic sensors which are connected to esp32. Esp32 has an inbuilt wi-fi system. Esp32 will pass the information of the dustbin to the mobile device through wi-fi.

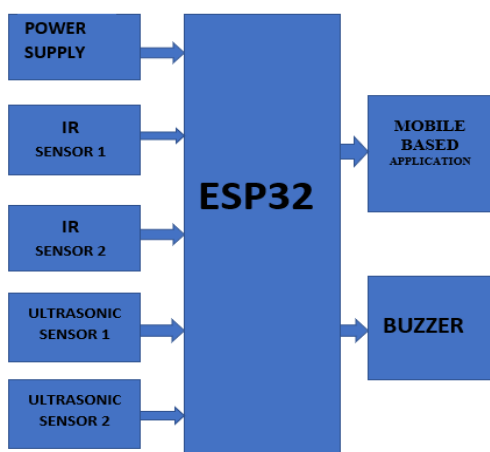


Fig. 1. System Architecture

A. Hardware Requirements

1. ESP32

ESP32 is a series of low-cost, low-power system on a chip microcontrollers with integrated Wi-Fi and dual-mode Bluetooth. The ESP32 series employs either a Tensilica

LITERATURE

Xtensa LX6 microprocessor in both dual-core and single-core variations, Xtensa LX7 dual-core microprocessor or a single-core RISC-V microprocessor and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules.

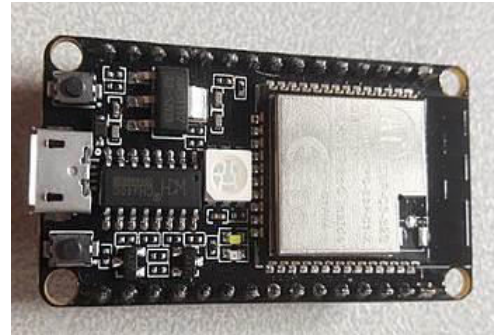


Fig. 2. ESP32

2. Infrared Sensors

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion as well as the presence of an object due to intervention or interruption. These type of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor, an IR sensor is simply a device which detects IR radiation falling on it.

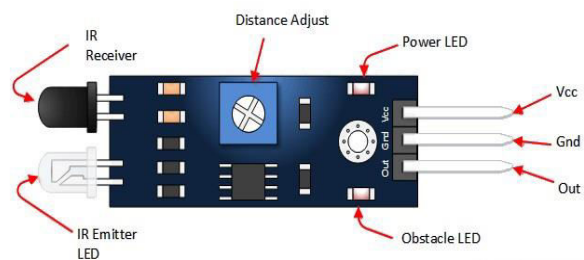


Fig. 3. IR Sensor

3. Ultrasonic Sensor

Ultrasonic Sensors also known as transceivers 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 18,000 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.

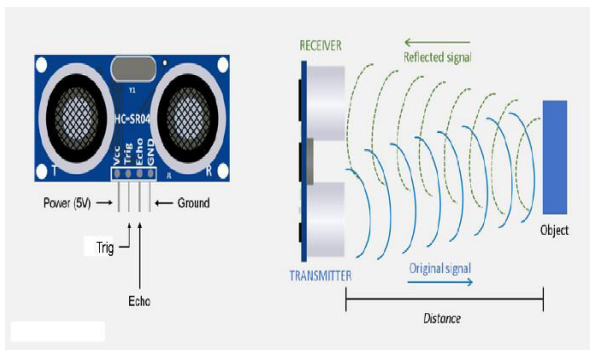


Fig. 4. ULTRASONIC Sensor

4. Software Requirements

- Downloading Arduino IDE software and then power up Arduino Board.
- Launching Arduino IDE.
- The Arduino integrated development environment is a cross platform Application, that is written in Java programming language and C/C++.

B. Implementation Of Project

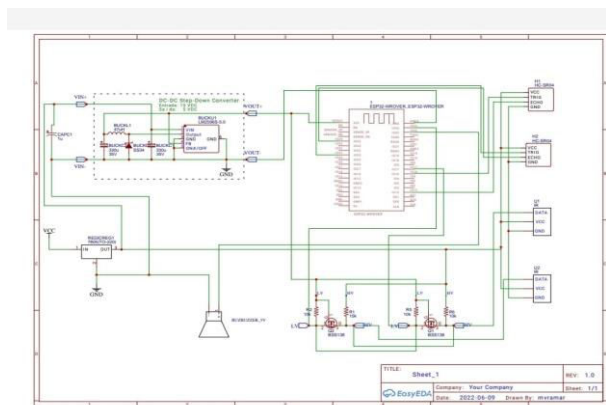


Fig. 5. Schematic Diagram

Block diagram consist of components are Arduino Uno, Moisture sensor fC-28, Ultrasonic sensor HC- SR04, DC motor, relay and ESP8266 Wi-Fi module etc. Moisture sensor is used to detect garbage is either dry or wet. Two DC motors are used; one is for moving conveyor belt and second is for rotating dustbin position to collect garbage in separate dustbin. Relays are used for driving DC motors. Ultrasonic sensors are used to detect garbage level in dustbins, to determine the dustbin is full or empty. One is used to detect garbage level of dry dustbin and second is to detect garbage level of wet dustbin. First power supply to Arduino is given through USB from laptop & external 12V power supply is given to both DC motors. In our project first garbage is placed on conveyor belt, then conveyor belt will move through DC motor then moisture sensor will detect garbage is dry or wet, if garbage is dry then it is collected in dry side of dustbin and if garbage is wet then dustbin will move 180 degree & collect garbage in wet side of dustbin. After this ultrasonic sensor will detect level of garbage in dustbins and send information to Arduino, then Arduino send this information to Wi-Fi module & wifi module update this information on mobile app. In the circuit diagram A0 pin of moisture sensor is connected to port C A0 pin of the Arduino. VCC & GND pins of moisture sensor are connected to 5v & GND of the Arduino. Trigger & echo pins of ultrasonic sensor 1 are connected to port D pin 4 & pin 5 of the Arduino respectively. Similarly trigger & echo pins of Ultrasonic sensor 2 are connected to port D pin 6& pin 7 of the Arduino respectively. Then VCC & GND of both ultrasonic sensors are connected to 5v & GND of the Arduino. DC motor 1 & DC motor 2 are connected to port B pin 0 & port B pin 1of the Arduino through Relay. Then VCC & GND of both relays are connected to VCC & GND of the Arduino. One end of the voltage divider network is connected to 5v & other end connected to port B pin 4 of the Arduino. VCC pin of ESP Wi-Fi module is connected to voltage divider network & GND is connected to GND of the Arduino. Reset pin of Wi-Fi module connected to the reset pin of Arduino.

V.

RESULT

Here we are using a one variable voltage source & we set -250V as a threshold value. By varying voltage below threshold value we got output on virtual terminal that is dustbin is not full. In proteus we connect this variable voltage source to the analog pin of ultrasonic sensor, connect trigger & echo to Arduino and potentiometer is using as

moisture sensor and connecting to A0 pin of Arduino. Now upload the Arduino hex file ,after uploading the hex file, hit RUN button then virtual terminal will display distance measurement i.e. dustbin is either full or empty.

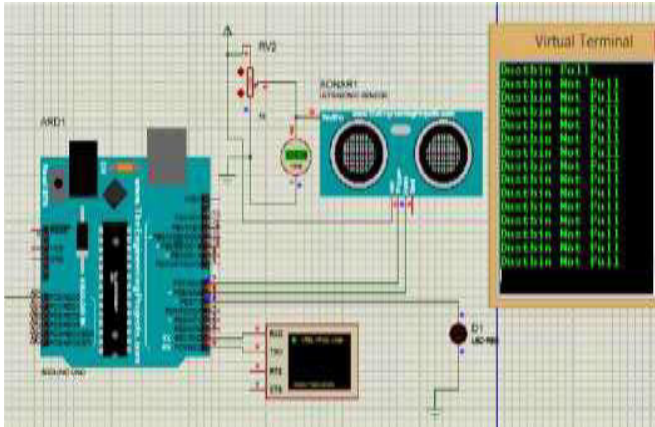


Fig. 6. Simulation when dustbin is not full

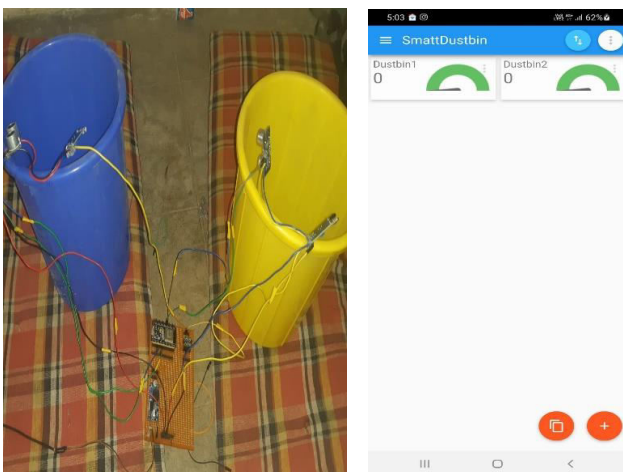


Fig. 7. status of the dustbin when it is empty

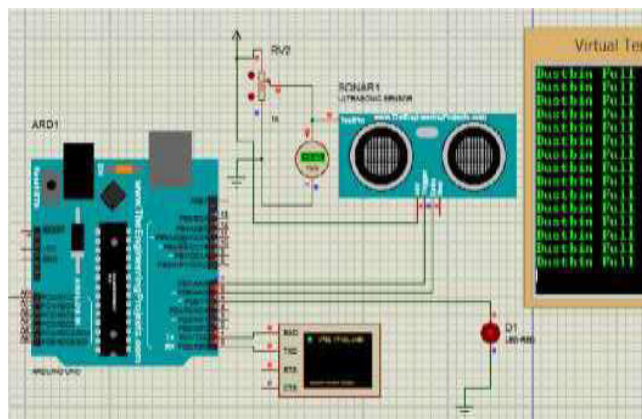


Fig. 8. Simulation when dustbin is full

Following pictures show the mobile app status and real time dustbin for 50% full dry & 100% full wet dustbin as well as database also.

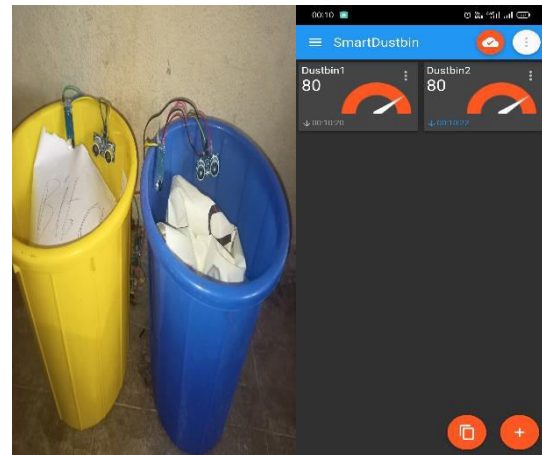


Fig. 9. Status of the dustbin when it is full

VI. CONCLUSION

The targeted waste collection saves times, money, and fuel and also reduce exhaust gas emission. Even garbage truck tours can be reduced by 30%. Hence by this project we can deal with RF technology, collection of garbage to make the premises clean.

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