E-Dustbin Implementation for Smart Cities

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Abstract: we are living in a world that is in a state of constant up-gradation, but there is one ubiquitous problem that we haven't been able to deal with, the problem that is impeding our advancement to a hygienic, clean and healthy society, is garbage. Mostly in our daily life we encounter dustbins that are excessively full and garbage spilling out of them. This kind of situation is neither good for our environment nor for our advancement. This problem leads to huge number of diseases as large number of insects and mosquitoes breed on the waste accumulated in this garbage. Hence, we developed a project to control the overfilling of the dustbin by making the dustbin smart enough to notify itself for its cleaning. In this project the smart dustbin management system is built on the microcontroller based system having ultrasonic sensors on each of the four dustbins that will show the current status of garbage on the LCD screen as well as on the mobile.

Keywords: ATMEGA328P, Ultrasonic Sensor, ESP8266, IR Sensor, PIR sensor.

1. Introduction:

The quantity of waste generated and their potential impacts depend on multifarious factors, including the level of industrial development, the way in which wastes are managed, the existing state of the local environment and the capacity of the receiving media. Nowadays, cities with developing economies experience exhausted waste collection services, inadequately managed and uncontrolled dumpsites and the problems are worsening. The key issue of an inadequate waste management is that the garbage[1] bin at public places gets overflowed well in advance before the commencement of the next cleaning process. Hence, we need such a system that can deracinate or at least minimize this problem to some extent. With the advancement in technology it is high time that we use technology for waste management systems. The Smart Dustbin[2] is a singular solution to the specific and peculiar problems in waste management. In this proposed system there are four dustbins and are denoted by four location East, West, North and South, these dustbins are equipped with low cost devices. This design signifies the technique through which the status of the garbage in each dustbin can be checked by the admin as well as by the employee assigned to each dustbin at regular intervals which will help in preventing the undesirable overflow of dustbins. The Wi-Fi module ESP8266 will act as an interface between the hardware and the software whereas the ultrasonic sensors will sense the height of the garbage inside the dustbins. In addition to this the East dustbin will be have the feature of opening it's led with an informative message when it detects any motion and to lure people it will give an incentive by polishing shoe with help of PIR sensor, APR module and IR sensor respectively.

2. **LITERATURE SURVEY:** Since smart cities are becoming center of attraction for the advancement of developing countries and without the removal or solution to the garbage problem these cities will be not that attractive. presented an Arduino Uno micro controller based smart garbage[3]

monitoring system to ascertain the level of waste in the garbage bin [4]in real-time and before there is overflow in garbage bin the system sense out and alert through SMS municipality for the bin to be emptied an garbage to be collected immediately.

3. **METHODOLOGY**: The automation of the smart dustbin is achieved through the use of a power supply, Microcontroller (ATmega328P), APR module, PIR sensor, servo motor, and ultrasonic sensor all programmed using Arduino IDE. In addition, DC motor and IR sensor are used for the incentive that is shoe polisher. A block diagram of the control circuit is shown in Figure.

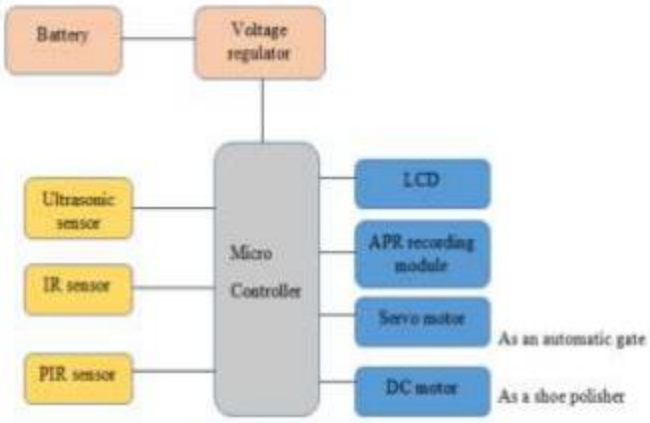

Figure 1. Block diagram

4. Hardware:

1 .ATmega328P: ATmega328P is a microcontroller that is manufactured by Atmel. It is a high-performance Atmel 8-bit AVR RISC-based microcontroller that combines 32KB ISP non-volatile storage with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, twenty three general purpose I/O lines, thirty two general purpose operating registers, three versatile timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. This device operates between 1.8-5.5 volts.

2 **Ultrasonic Sensor**: n Ultrasonic sensor is a device that measures the distance of an object with the help of sound waves. It measures distance through sending out a sound wave at a particular frequency and listening for that wave to bounce back. It is possible to measure the distance between the sensor and that object by recording the elapsed time between the sound wave being generated and the sound wave bouncing back. In other words, the sensor head emits an ultrasonic wave and receives the wave that is reflected back from the target. The distance can be calculated with the following formula: Distance = 1/2 × T × C Where T is the time between the emission and reception, and C is the speed.

3 ESP8266 Wi-Fi Module: The ESP8266 WIFI Module is a self-contained SOC with integrated TCP/IP protocol stack that can offer any microcontroller access to your Wi-Fi network. It is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

Each ESP8266 module are pre-programmed with an AT command set firmware, which simply means, that it can be simply hooked to the Arduino device and can get as much WIFI-ability as a Wi-Fi Shield offers. The ESP8266 module is highly cost-effective board with a large, and ever growing, community. It supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF that allows it to work under all operation conditions and no external RF parts are required.

4. LCD: LCD screen is an electronic [5]display module and have a wide range of applications. A 16x2 LCD display is a basic module which is commonly used in various devices and circuits. These modules are preferred over the seven segments and other multi segment LEDs. A 16x2 LCD means that it can display 16 characters per line and there are 2 such lines. Each character is displayed in 5x7 pixel matrix in this LCD.

5 PIR Sensor: PIR sensors allow us to sense motion. They detects whether a human has moved in or out of the sensor‘s range. Commonly they are found in appliances and gadgets that are used at home or for businesses..

6 IR Sensor: An infrared (IR) sensor is an electronic device that emits so as to sense some aspects of the environment. An IR sensor can detect the heat of an object as well as the motion. Whenever the IR sensor senses an object close enough to it, the light from the LED bounces back from the object and into the light sensor.

7 APR Module: APR module a single chip Voice recorder and a Playback device for 20 to 30 seconds maximum voice recording and play back. It is considered as an ideal IC for automatic answering machine, door phones etc. This IC has a data storage capacity and no software and microcontroller is required. It provides a high quality voice recording and play back up to 30 seconds.

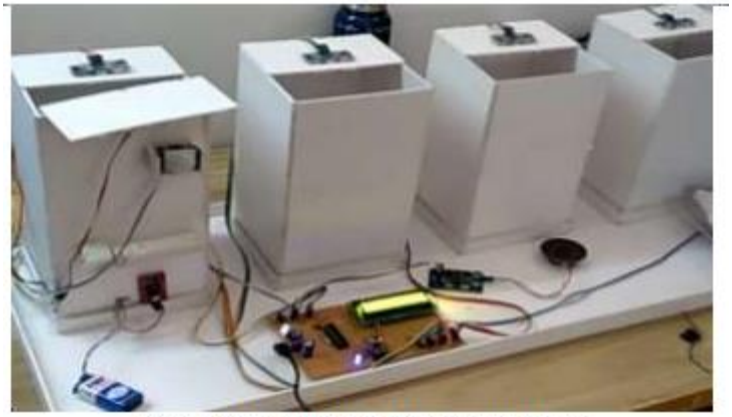

Figure 2.Smart Dustbin Management System

5. **RESULTS:** The experimental set up of the Smart Waste Management[6] system in which the first dustbin contains the PIR sensor for detecting the motion so that the gate opens, APR module for voice message and IR sensor for shoe polishing is shown in Figure 2. If the dustbins are empty the value on LCD and on app will be 100%. When there is some waste[7] in any of the dustbin

shown in figure 3 the value on the LCD changes with respect to that dustbin and when this system is connected to the network via Wi-Fi module the it sends the data to the app which shows the same value that can be checked by the admin or by an individual employee assigned to that particular dustbin shown in figure.

6. References:

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