Smart Dustbin with IoT Notification

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Abstract:

As people are getting smarter so are the things. While the thought comes up for Smart cities there is a requirement for Smart waste management. The idea of Smart Dustbin is for the Smart buildings, Colleges, Hospitals and Bus stands. The Smart Dustbin thus thought is an improvement of normal dustbin by elevating it to be smart using sensors and logics. Smart dustbins is a new idea of implementation which makes a normal dustbin smart using ultrasonic for hand detection and IR sensors for garbage level detection and monitoring status is displayed onto Blynk app notification at vertical level using Wi-Fi Esp8266 module. The controlling device of the whole system is PIC Microcontroller. The dustbin setup door can be operated using servo motor. Visual alerts display using LCD module.

Keywords:

PIC Microcontroller, Ultrasonic sensor, IR sensor. LCD display, ESP8266 Wi-Fi module, Servo motor, BlynkAPP.

1. Introduction:

The system uses an ultrasonic sensor near the dustbin door which senses the person/obstacle presence and operates the dustbin door using servo motor accordingly. We use two IR sensors which are placed inside the dustbin which detects the levels (Zero, Half, Full) of dust inside the dustbin when it detects the dustbin reached to level three (Full) it alerts the user through Blynk app notifications using Wi-Fi. The sensor gives the information to the microcontroller which in turns sends the same to the mobile Blynk app about dustbin status whether dust content is full or half or empty. The system also alerts the user through notifications in the form of blinks to the mobile even when the Blynk app is closed.

This project makes use of an onboard computer, which is commonly termed as micro controller. It acts as heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used. The controller is provided with some internal memory to hold the code. This memory is used to dump some set of assembly instructions into the controller. And the functioning of the controller is dependent on these assembly instructions.

The main controlling device of the project is PIC microcontroller which loaded program written in embedded C language. Visual alerts display using LCD module.

2. LITERATURE SURVEY:

1. 1twinkle sinha, 2k.mugesh kumar, 3p.saisharan (5,may2015) proposed Smart Dustbins can prevent the accumulation ofthe garbage along the roadside to a great extent thereby controlling the widespread of many diseases. It can prevent pollution and alsoprevent the consumption of the spread out garbage by the street animals. This Smart Dustbin can contribute a lot towards a clean and hygienic environment in building a smart city.[1]

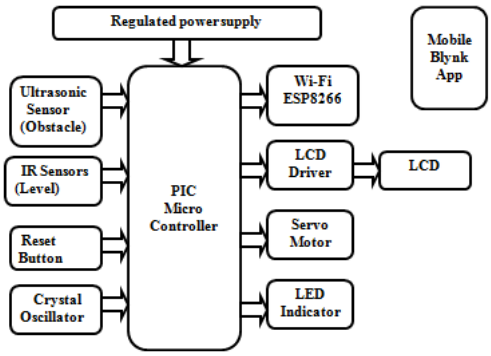
2.Swati Sharma*1 & Sarabjit Singh(May, 2018) proposed smart dustbin management system using IoT as a hardware and ionic framework as our software insures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority in our case the admin who can take appropriate action against the concerned employee. This system also shows the use of PIR sensor, IR sensor and APR module. When some motion is detected by the PIR sensor it opens the gate of West dustbin using the servo motor and when the PIR detects the motion APR module gives the information fed into it of minimum 30 sec. For our lucrative part that is shoe polish we have used IR sensor and to rotate the brush we have used the DC motor.[2]

3. Narayan Sharma, Nirman Singha, Tanmoy Dutta (9, September-2015) proposed The smart-bin

designed will be sending data about the levels of garbage collected in different parts of the city/town. The dataset created can be analyzed to gain lots of insights. The collected data set over a period of time will create a historical data set.[3]

4.Fady E. F. Samann(28 June 2018.) proposed system is based on Arduino Nano board and an ultrasonic sensor to monitor the fullness level of the container and give SMS alerts using a GSM module. The system is powered by lithium battery power bank supported by solar cell panel. The system provides an option of charging external portable devices using the power bank. Moreover, the system will store usage events, recorded by PIR sensor, and fullness events on a memory card, which is also used to play audio message using a speaker, when the bin is being used. Finally, the system is implemented successfully with an acceptable overall cost for the intended application. The system performance was found satisfactory according to the obtained test results.[4]

3. Implementation:



3.1 Block Diagram of Smart Dustbin with IoT Notification

The design can be implemented with PIC16F873microcontroller. The interfaced devices to the PIC microcontroller are IR sensor, Ultrasonic sensor, LCD display, ESP8266 WI-FI module, servomotor along with dustbin setup. The PIC Microcontroller continuously read the data from Ultrasonic, IR sensor .When the sr04 ultrasonic sensor detects the hand it will give to the PIC Microcontroller then microcontroller open the dustbin door through servo motor. After through the dust into the cap will be closed automatically. Microcontroller measure the dust level using IR sensor and monitor the dust level on LCD display and also send the notification to the user mobile onto the blynkapp about dust level through Wi-Fi module. The main controlling device of the project is PIC microcontroller which loaded program written in embedded C language.

4. Related Work:

The brief introduction of different modules used in this project is discussed below:

4.1. PIC Microcontroller.

4.1.1 PIC16f873Microcontroller

Name	Value
Program Memory Type	Flash
Program Memory Size (KB)	7
CPU Speed (MIPS/DMIPS)	5
SRAM (B)	192
Data EEPROM/HEF (bytes)	128
Digital Communication Peripherals	1-SPI, 1-I2C1-MSSP(SPI/I2C)
Capture/Compare/PWM Peripherals	2 Input Capture, 2 CCP,
Timers	2 x 8-bit, 1 x 16-bit
ADC Input	5 ch, 10-bit
Temperature Range (°C)	-40 to 85
Operating Voltage Range (V)	2 to 5.5
Pin Count	28

4.2. IR sensor:

Fig: IR sensor

The IR sensor module consists mainly of the IR Transmitter and Receiver, Opamp, Variable Resistor (Trimmer pot), output LED in brief. IR LED Transmitter. IR LED emits light, in the range of Infrared frequency. IR light is invisible to us as its wavelength (700nm – 1mm) is much higher than the visible light range.

4.3. 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. .

4.4 LCD Display:

One of the most common devices attached to a micro controller is an LCD display. Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

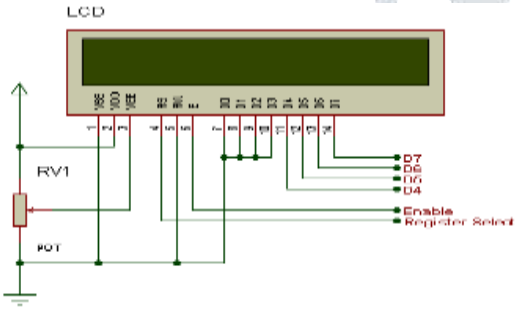


Fig: LCD display

The LCD requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an 8-bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus).

4.5 Wi-Fi module (esp8266):

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

Fig: ESP8266 Wi-Fi module

Electrical Characteristics

Working Voltage: 3.3V

Maximum IO Driving Power IMAX: 12 mA

Maximum IO Voltage Level VMAX: 3.6V

Current Consumption: 100mAmp

4.6 Servo motor:

Fig: Servo motor

The servo motor is a closed-loop mechanism that incorporates positional feedback in order to control the rotational or linear speed and position. The motor is controlled with an electric signal, either analog or digital, which determines the

amount of movement which represents the final command position for the shaft. In this project we are using servo motor to open and close of the dustbin cap.

5. CONCLUSION:

The Presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for "Smart Dustbin with IoT Notification" has been designed perfectly. Secondly, using Wi-Fi technology to send the notification into the blynkapp about dust level and PIC C compiler for dumping the code into the microcontroller. Thus the project has been successfully designed and tested.

6. ACKNOWLEDGEMENT

We would like to thank all the authors of different research papers referred during writing this paper. It was very knowledge gaining and helpful for the further research to be done in future.

7. RESULTS:

Fig: 7.1 Dust bin setup Image

Fig: 7.2 Dust level monitoring in blynkapp

Fig: 7.3 Hand detection and dustbin cap open

Fig: 7.3 Notification in blynkapp and Dust level monitoring on LCD module.

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