J. Adv. Res. in Computer Graphics and Multimedia Technology
Volume 2, Issue 2- 2020, Pg. No. 11-14
Peer Reviewed Journal

Article

IoT Based Smart Garbage Monitoring System

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I N F O

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How to cite this article:
Dash MM, Panda A. IoT Based Smart Garbage Monitoring System. *J Adv Res Comp Graph Multim Tech* 2020; 2(2): 11-14.

Date of Submission: 2020-06-10
Date of Acceptance: 2020-08-14

A B S T R A C T

As we know population is increasing day by day rapidly. As population increases the amount of waste materials also increases, the sketch of neatness is also degrading. Many times we see that the garbage bins are placed at public place in the cities are overflow due to due to increase of waste everyday. It creates unhygienic and bad smell around the surrounding that leads in spreading some deadly disease and human illness. To solve this problem we are planning to design "Smart Garbage Monitoring System" by using IoT (Internet of Things) for smart cities that makes human lives more comfortable and secured. This is an improvement model of normal dustbin by elevating it to be smart sensors and logics. It smarts the normal dustbin by using Ultrasonic sensor for garbage detection and sending message to the user updating the status of the bin using GSM module. We can use this in hospitals, bus stand, college campus and many other public places.

Keywords: IOT, Arduino, Microcontroller, GSM, Ultrasonic Sensor, Servo Motor

Introduction

"Learn neatness from the cat". The structure beyond this proverb is that keeping environment clean. "Environment" is essential for everyone and present everywhere, that supply all natural needs in a plentiful manner and also we have some responsibilities towards our environment. In our daily life we see the picture of garbage bins are overflow and all garbage spills out. This leads to the number of disease as large number of insects and mosquitoes bred on it. To avoid this "Smart Garbage Monitoring System" should be adopted which can be very helpful for our society. People are more interested to use technologies which can reduce their time and effort in efficient manner. It is helpful to develop green and smart city. For this we have to develop fully automated garbage bin which will first able to open the lid automatically when we are near to this and also detect the current status of the bin using Ultrasonic sensor when the bin is full it will send a message to the user with the help of GSM module to the register mobile number to clean the bin. This system is worked under IoT technology. Now-a-days IoT technology is widely used. Through this technology sensors are embedded with garbage and store data.

Statement of Problem

In this paper, we are going to propose a system for the immediate cleaning of dustbins. In this proposed system there are many dustbin are located in every city which are in bad condition. As dustbin is considered as a basic need to maintain the level of cleanliness in the city. So it is very important to clean all the dustbins as soon as they get filled. To avoid such situation we are planning to develop "Smart Garbage Monitoring System".

Objective

The main objective of this project is to design, develop and implement automated "Smart Garbage Monitoring System". In this paper we have tried to upgrade the trivial but vital component of the urban waste management system. The waste disposal can be managed more properly and efficiently by constantly monitoring the bin status and garbage level.

Figure 1.Problem of statement

This is finished by the cycle of interaction stream of detecting, information move and informing which bode well to be open naturally as we close to this and we get message when dustbin is full, this interaction is constrained by Arduino plat structure.

Block Diagram

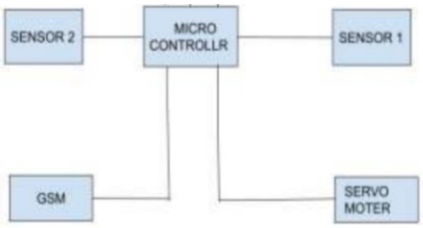

Figure 2.Block diagram

The essential activity of the framework is it is naturally open the cover when we are close to this with the assistance of servo engine and ultrasonic sensor. The completion status of the container is dictated by figuring the distance between the top of the receptacle and the rubbish by utilizing a sensor. At the point when distance estimating sensor shows that the receptacle is full, at that point a microcontroller board will control a GSM module to send SMS alarm to the register versatile number.

Figure 3.Arduino Uno Board

Hardware Description

Arduino Uno R3

The Arduino Uno is a microcontroller board dependent on the ATmega328 of AVR family. Arduino Uno is an open-source, gadgets stage dependent on simple to-utilize equipment and programming. Arduino sheets can understand inputs, light on a sensor, a finger on a catch or a twitter message and transform it into a yield. Enacting an engine, turning on a LED, distributing something on line. You can guide your board by sending a bunch of microcontroller on the board. To do so you are the Arduino programming language dependent on wiring and the Arduino software (IDE) based on processing.

Ultrasonic Sensor

The HC-SR04 Ultrasonic sensor utilizes sonar to decide distance to an item like dolphins. Ultrasonic sensors work by transmitting sound waves at a recurrence excessively high for people to hear. At that point they trust that the sound will be reflected back, figuring distance dependent on the time required. It gives 2cm-400cm non-contact estimation work. The going accurancy can reach to 3mm. The modules incorporate Ultrasonic transmitter, beneficiary and control circuit.

Figure 4.Ultrasonic sensor

GSM SIM900A Module

GSM (worldwide framework for portable correspondence) is an open computerized cell innovation utilized for sending versatile voice and information services. GSM is a circuit-exchanged framework that isolates each 200KHZ channel into 25KHZ schedule openings. GSM upholds information move speeds upto 9.6kbit/s, permitting the transmission of essential information administrations, for example, SMS (short message administration). GSM is here to interface with microcontroller and microcontroller order to the GSM module with AT (contraction of lessening) order set executed in our program.

Figure 5.GSM SIM 900A module

Servo Motor

Servo engine are utilized to control the situation of articles, pivot objects, move legs, arms or hands of sensor, move sensor and so forth It additionally requires a moderately complex regulator, frequently a committed module planned explicitly for use with servo engine. Servo engine is a shut circle servo component that utilizations position criticism to control its movement and last position. Servo engines are DC engines that are takes into account exact control of rakish position. They are really DC engines whose speed is gradually brought down by the pinion wheels. The Servo engines generally have the cutoff from 90° to 180°. A couple of Servo engines additionally have unrest cutoff of 360° and then some. However, Servo engines don't turn continually. Their turn is restricted in the middle of fixed holy messengers.

Figure 6.Servo motor

Jumper Wire

A jumper wire or hop wire is an electrical wire or gathering of them in a link, with a connector or pin at each end, which is ordinarily used to interconnect the segments of a breadboard or other model or test circuit, inside or with other hardware of parts, without fastening.

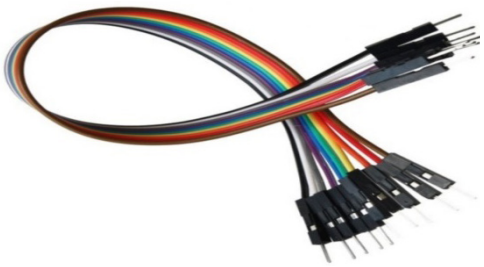

Figure 7.Jumer Wire

Breadboard

An advanced solderless breadboard comprises of a punctured square of plastic with various tin plated phosphor bronze or nickel silver compound spring cuts under the holes. The clasps are frequently called the focuses or contact focuses. It doesn't need fastening since it solderless, it is reusable. An assortment of breadboard framework might be prototyped by utilizing breadboards from simple and computerized circuit to complete Central Processing Units (CPU).

Figure 8.Breadboard

Software Specification

The Arduino IDE (coordinated advancement climate) is a cross-stage application (for windows, maCos, linux) that is written in capacities from C and C++. It is utilized to compose and transfer projects to Arduino viable sheets, yet additionally with the assistance of outsider centers, other merchant improvement sheets. Projects composed utilizing Arduino programming (IDE) called draws. These portrayals are written in the content manager and are saved with record expansion .ino. While saving the projects are gives criticism and furthermore show mistakes. The support shows text yield by the Arduino programming (IDE), including total mistake message and other data. The botton right hand corner of the window shows the designed board and sequential port. The toolbar catches permitted you to check and transfer programs, make, open and save portrays and open the few screen. IDE is cordial with C and C++.

Circuit Diagram

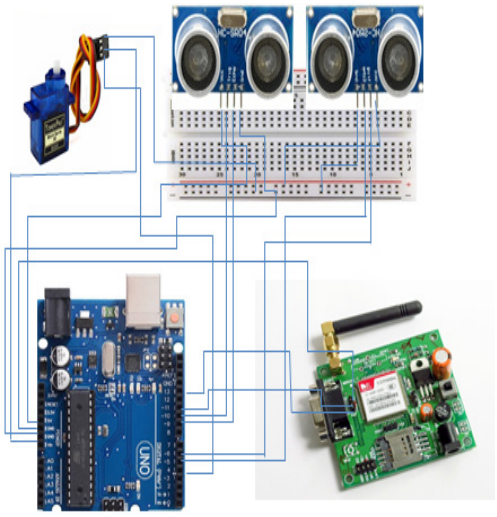

Figure 9.Circuit diagram

Code Uploading

The code/ program written in Arduino IDE which installed in PC/ laptop is considered as the software part which

is embedded in the Arduino microcontroller using 5v& 12v USB cable. The Arduino Uno is the hardware of the system and the whole system works according to the set of instructions or program uploaded in the Arduino Board.

The following steps are done at the software part i.e. Arduino IDE upload the code in Arduino microcontroller

- Select "Tools"→"board"→[arduino board]. In our case it is Arduino.
- Then select "Tools"→"serial port"→[your serial port used for communication with Arduino].
- Click on "file"→"upload" to upload code to Arduino.

At the PC/laptop Arduino IDE is running which complies the application program and sends its complied hex code to the Arduino board board over USB cable.

Hardware Implementation

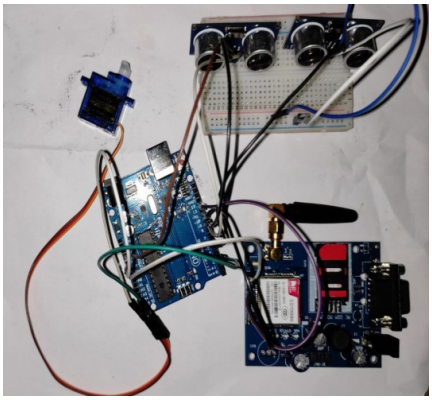

Figure 10.Hardware implementation

The system was checked repeatedly by increasing and decreasing the level of garbage in the bin. This smart garbage monitoring system will automatically open its lid when we near to this and also detects the status of the bin when the dustbin is full it will send the message to the number which is used in program.

Result and Observation

- Checking the totality of containers using sensors, Ultrasonic sensor is presented for effective and monetary trash assortment. The created framework gives improved data set to trash assortment time and waste sum at every area. We dissected the arrangements at present accessible for the usage of IoT. By executing this undertaking we can dodge the streaming of trash from the holder and it likewise helps in-
- Monitors the trash container and illuminates about the level trash gathered in the trash receptacles.
- To keep our Environment spotless and green. The cost & effort are less in this system.
- This project is also helpful in the government project of "SWACH BHARAT ABHIYAN".

Conclusion and Future Scope

World is changing extremely quick from dispatching satellite to space, our innovation has reached to 5G however we have fail to remember our home planet earth. In subsequently paper we have researched a portion of the mechanized and practical methodologies dependent on programming module are a lot of effective to shield the climate from contamination in hygienic and furthermore holds consent to create green and savvy city. So keen dustbins are appropriate as a significant part in keen urban areas are. In future different strategies can be utilized with this framework like-

- Sonar board can be utilized
- Virtual worker can be
- Water verification circuit plan
- Human machine interface

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