Garbage Monitoring System with IoT

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ABSTRACT

In today's world, time is a vital issue which cannot be managed by noticing every phenomenon with our tight schedule. So Automatic systems are being preferred over the manual system to make life simpler and more comfortable in all aspects; certain actions are taken to improve the level of cleanliness in the country. People are getting more active in doing all the things possible to clean their surroundings. We are trying to build a system which will notify the user to empty the bin on time. In this system, we will put a sensor on top of the garbage bin which will detect the total level of garbage inside it according to the total size of the bin. By using this system, people do not have to check all the systems manually. What our system does is it gives a real- time indicator of the garbage level in a trashcan at any given time.

1. INTRODUCTION

In Smart Garbage Monitoring System, Garbage may consist of the discarded substance left over the urban, public area, Society, College, home, etc. This paper is related to the "Smart bin" and is based on "Internet of Things" (IOT). Cleanliness is a must in a smart lifestyle, and cleanliness begins with Garbage Bin. This paper deals with the minimization of the garbage disposal problem that we face nowadays. The projected structure is very new and helps to keep clean and manage trash. The inter-networking of physical world and sensors are described as the Internet of Things (IoT). These physical devices are connected to wireless or wired internet connections, i.e., IoT is the connection of embedded systems to the internet. To notice the junk quantity the ultrasonic sensors which are positioned inside the bins are used in this proposed system. The monitoring of the entire garbage bin is done using a microcontroller. Wireless systems are situated along with central system with a microcontroller in this projected structure. The sensor at the top of garbage will absorb the various level of garbage inside the bin. The

intensity of garbage is indicated by the GSM module, and the system operation is controlled by node MCU, and the application will be installed in the user's mobile to get a notification when the bin is full, and there is a need to empty the bin.

We are interested in the development of products like Smart Bin that will send alerts through cellular communication to a user when a bin needs to be emptied. In recent times, garbage disposal has become a huge cause for concern in the world. A large amount of waste that is generated is disposed of by means which harm the environment. The common method of disposal of the waste is by unplanned and uncontrolled open dumping at the landfill sites. This method is injurious to human health, plant and animal life. The purpose of this project is the realization of a compact, low cost, and user-friendly segregation system for urban households to streamline the waste management process.

2. INTERNET OF THINGS

IoT helps people and things to be connected anytime, anyplace, with anyone, ideally using any network and any service. Automation is another important application of IoT technologies. It helps to monitor and control the garden environment by using different types of sensors and actuators that control lights, temperature, and humidity, moisture, soil pH. Smartp hones, internet, televisions, sensors, and actuators are connected to the internet where the devices are intelligently linked together which enables them a new form of communication. This happens amongst people and themselves with the help of IoT.

The significant development of IoTs over the last couple of years has created a new dimension to the world of information and communication technologies. The IoTs technology can be used for creating new concepts and wide development space for smart homes in order to provide intelligence, comfort and improved quality of life.

The rising number of internet-enabled devices which can network and communicate with web-enabled gadgets and with each other is already underway, the Internet of Things describes this revolution. Everything like objects, vehicles, environments, furnishings, and clothing will have more and more information associated with them. It also can become an integral part of the Internet, produce more valuable information, network, communicate, sense, etc. All these states are referred to by the Internet of Things (IoT).

Materializing of IoT is possible by the development of sensors, actuators, mobile phones, and the internet. RFID tags help to cooperate and interact with each other. By this, the service would be better and can be accessed from anywhere and anytime. Thus, to produce seamless communication and service, then IoT will connect all the objects around us like electrical, electronic, non-electrical, etc.

IoT helps to link the objects of the virtual world with the real world so that the connectivity is enabled anytime for anything at any place. It will create a new world where all the living beings, physical objects, environment, real-life data, and virtual

data will interact with each other at the same time and same place. The path of development and improvement of the Internet has been on a steady path, but it has not changed abruptly. From the ARPANET era, it does the same thing. Today, the standardization of the Internet is an IP, but in the earlier days, there were several communication protocols like Token Ring, AppleTalk, and IP (Internet protocol).

Figure 1: Internet of Things (IoT) system

3. RELATED WORK

[1] City Garbage collection indicator using RF (Zigbee) and GSM technology. This paper gave the details for the module required for the transmission of the data to the receiver side, and also the main channel follows of the project. Initially, we used GSM technology for our project but later on decided to us Wi-Fi module for the ease of data transmission.

[2] Smart bin system proposed by Poornima B. Gupta, P. Ramakanth Kumar, B. S. Anisha. The architecture of Smart bin system can be analyzed as three-tier architecture: outdoor nodes, analytics, and workstation. Through the test bed, collected data and applied algorithms, litter bin utilization and litter bin daily information were obtained. With such analytics, litter bin distributors and cleaning contractors can make better decision to increase productivity and efficiency.

[3] Garbage waste management system proposed by N.Sathish, Kumar, B, Vijaylakshmi, R.Jenifer, Prarthana, A.Shankar IoT based architectural solution to tackle the problems faced by the present garbage waste management system. By providing a complete IoT based system, the process of tracking, collecting, and managing the garbage can be easily automated and controlled effectively. The bins will be fitted with IR sensors to detect the level of Garbage collected. A gas sensor will be used to detect the presence of any harmful gases, a load cell is used to measure the weight of the bin, and indicators like LEDs and LCD will be used for notifications.

[4] Smart Garbage Management System by Vikrant Bhor, Pankaj Morajkar, Maheshwar Gaurav, Dishant Pandya. It provided us with additional details and designs needed for flow and management of garbage while the collection.

4. REQUIREMENTS

A. Ultrasonic Sensor: The device called ultra-sonic sensor is used to detect the distance from which the object is separated from it. The principle behind this is that it sends out the sound waves, and it waits for reflection of a sound wave from the object under consideration. By noting down the time lag between the sent and received wave, it is possible to measure the distance of the object from the sonar sensor.

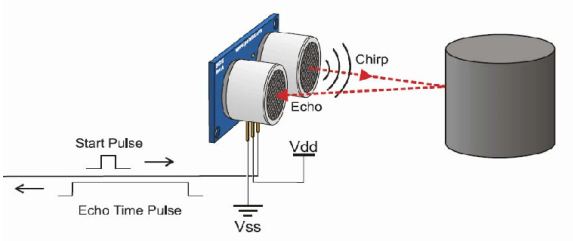

Figure 2: Basic Ultrasonic Sensor

Figure 3: Ultrasonic Sensor

As we know that sound wave travels through air at a speed of 344m/s, to find the round trip distance of sound wave, the return time is multiplied by 344. Round trip Distance refers to twice the distance of the object from the sensor. The actual distance is calculated by diving round trip distance by 2. Distance (speed of sound x time taken)/2 It should be noted that not all objects are detected by sensor due its shape wherein some waves get reflected, size might be very small and the positioning angle

B. PIR Sensor: PIR sensor is an electronic sensor used to detect the motion of human being within a certain range of the sensor. Pyroelectric sensors that detect the levels of infrared radiation are used to make PIR sensors.

Working: Whenever human being moves in the field of view of the PIR sensor, it detects the infrared radiation emitted by a hot body motion as shown in figure.3. Thus, the infrared radiation detected by the sensor generates an electrical signal that is used to activate an alert system or alarm sound.

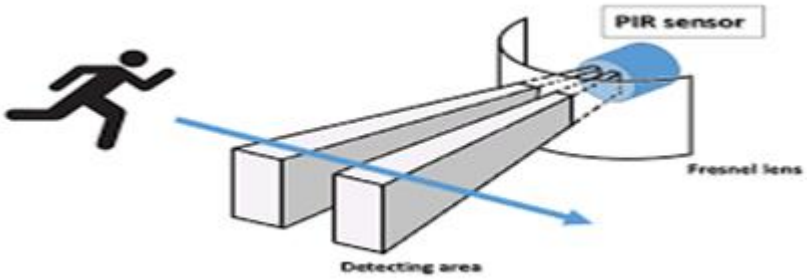

Figure 4: PIR Sensor working

The PIR sensor internally is divided into two halves, one half is positive, and the other is negative. Thus, one half generates one signal by detecting the motion of a hot body, and the other half generates another signal. The difference between these two signals is generated as an output signal. Primarily, this sensor consists of a Fresnel lens which is bifurcated to detect the infrared radiation produced by the motion of the hot body over a wide range or specific area, as shown in Fig.4 and also plays a role in the detection of the object. Some objects such as cloths, carpeting absorb the waves, where there is no way for the detection of such

objects. These are the factors to be noted.

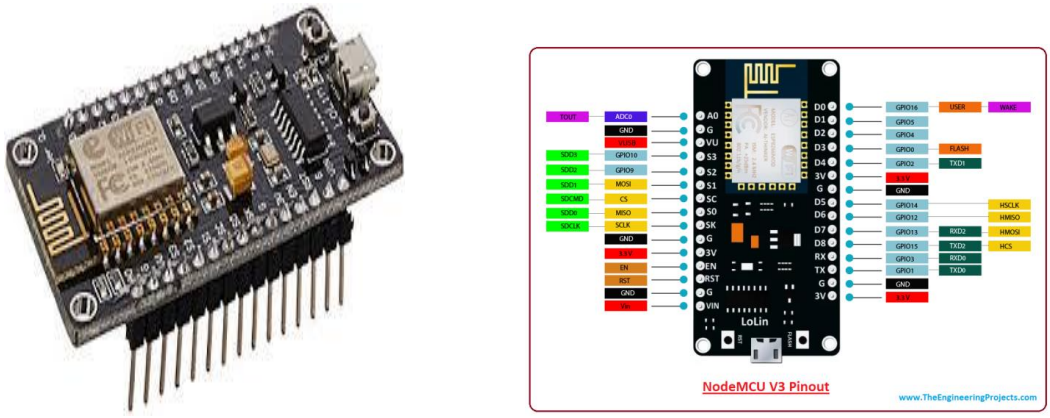

Figure 5: Node MCU hardware and pin connection display

(i) The LCD monitor displays the status of the garbage level. The system activates a signal when the level of accumulated trash exceeds the predetermined limit.

(ii) NodeMCU: NodeMCU is an open-source LUA-based firmware developed for the ESP8266 Wi-Fi chip. Built to explore the functionality of the ESP8266 chip, the NodeMCU firmware is used in conjunction with the ESP8266 Development board/kit, known as the NodeMCU Development board. The NodeMCU Dev Kit features Arduino-like Analog (A0) and Digital (D0-D8) pins on its board. It supports various serial communication protocols such as UART, SPI, I2C, etc. By utilizing these serial protocols, we can establish connections with serial devices like I2C-enabled LCDs, HMC5883 Magnetometers, MPU-6050 Gyroscopes + Accelerometers, RTC chips, GPS modules, touch screen displays, SD cards, and more.

(iii) BLYNK APP: Blynk is a platform with iOS and Android apps designed for controlling Arduino, Raspberry Pi, and similar devices over the Internet. It functions as a digital dashboard where you can create a graphical interface for your project through a simple drag-and-drop widget system. Blynk comprises three key components: the Blynk app for smartphones, the Blynk server, and the Blynk library (firmware), which is compatible with various hardware from different makers. Both the Blynk server and Blynk library are open-source, while the Blynk app is available for free on iOS and Android. Blynk has the capability to control a wide range of electronics, GPIOs, relays, and more. Its usage is straightforward, offering a secure, scalable, lightweight, and fast solution that can handle numerous requests from edge devices. Blynk Cloud, which is open-source, can be deployed within minutes and can run in various environments, including locally or on a dedicated Blynk Business Server.

5. METHODOLOGY

The smart Garbage Monitoring system is a highly innovative system that aims to maintain the cleanliness of a specific area. This setup effectively monitors the garbage bins and provides notifications regarding the level of garbage accumulation within these bins through the utilization of the BLYNK APP. For this purpose, the scheme employs ultrasonic sensors placed above the bins to measure the garbage level. The system incorporates the use of NODEMCU, which features a built-in WiFi module for data transmission, an LCD screen, and a buzzer.

6. CONCLUSIONS

The smart garbage monitoring system pays a lot towards clean and disinfected pollution less Environment in building a particular area clean. As this technology is new in India there should be appropriate consciousness and alertness among the public before the operation of this technology Otherwise, sensitive devices like sensors might be spoiled due to rough action of the users. It is an automatic dust bin monitoring system in order to sense the full condition of the garbage bins. This provides the authorized users appropriate updates of the location of the garbage bins and thus eliminates the need of intermittent manual checks and overflowing garbage bins. This method finally helps in keeping the environment clean.

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