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Real-Time Implementation of Smart Bin using IOT

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Abstract

With an increase in inhabitants, waste management is one of the primary problems that the world would face. In the current situation, the tidiness in terms of garbage management is diminished enormously. The waste management issue is that the garbage bin at a public place gets overflowed before the next cleaning process. It gives rise to various health hazards. To prevent this, Smart Bin is proposed in this paper, which can monitor the waste through sensors and give information to the authorities. Weight sensors are used to detect the quantity of garbage in the dustbin. In our proposed system, IR sensors and ultrasonic sensors are interfaced to the dustbin, and then it is directly connected to the Arduino controller. The entire sensor will measure and calculate the waste, and the information will be sent to the concerned authorities and to take necessary action. We can get the information through mobile phones.

Index Terms - *Internet of Things, IR Sensor, Arduino controller, WI-FI, Ultrasonic sensor*

I. INTRODUCTION

Garbage is an unwanted or useless material. It is used in the disposal of solids, liquids, and gaseous wastes. Disposal of waste can have a significant impact on the environment. It is the precise name for the collection, disposal or recycling, and monitoring the waste. It also encompasses the legal and regulatory framework that relates to waste management, encompassing guidance on recycling.Over1.8 billion tonnes of waste are generated each year in Europe. This equals 3.5 tonnes per person. This is mainly made up of waste from the household, commercial activities, industry, agriculture construction, mining, and quarrying activities. A gas sensor is used to avoid the leakage of toxic gases, and the information should pass through the investor interested in the system. In the design process, the WI-FI module is used and makes the inhabitants enhance smart cities [1]. By identifying the amount of garbage in a dustbin, whether it is empty or not, or else if it attains the maximum level, these can be detected by ultrasonic sensors and address the details to the concerned force [2]. If the garbage is filled in bins, by using GUI, the person could identify, and the cleaning process is done [3]. For a large number of dustbin located in the cities, exclusive ID is provided for each garbage bin to detect whether wastes are filled or not. A voice message is provided by the authorities whenever a person throws dust on the floor [4].RFID sensor is used to detect the garbage in dustbin and motor is used to close and open the bins, rotates in the clockwise and anticlockwise direction [5].

The rest of the paper is organized as follows. In Section II, we introduce the existing system and explain the architecture of the smart garbage bin. In section III, we described the proposed system along with a block diagram. The experimental result is shown in section IV. Finally, we discussed future enhancement in section V and concluded this paper.

II. EXISTING SYSTEM

When the dustbin is overflown, there will be heavy pollution in our environment. Due to this, the bad smell is spread, which causes various diseases to children. Smart Bin system helps to overcome these problems. These smart bins are connected with a microcontroller-based system with IR wireless sensors with a central system that shows the present status of garbage on mobile web browsers with HTML pages through WI-FI.

Nowadays, IOT can control and monitor the equipment we use in daily life. These are done with the help of sensors. Sensors are used to measure physical quantities such as temperature, light, pressure, sound, humidity. They send a signal to the processor. In this manner, we can monitor the environmental changes from anywhere through the internet.

Smart bin also works similarly, with the help of weight sensors and IR sensors. They show different levels. Various level of garbage in the bin is showed by IR sensors, and the weight sensors send its output when the threshold level is crossed. The microcontroller gives further details to the transmitter module. Our mobile should be connected to WI-FI So that the details of the smart bin could be displayed on the HTML page.

Weight Sensors

The weight sensors are used to detect the amount of waste in the smart bin. It works on the piezo-resistivity.

Wi-Fi Module

802.11b/g/n protocol, WI-FI direct (p2p), soft-AP, integrated TCP/IP protocol stack. This protocol equally works in LAN and WAN. The details of the dustbin are sent to the receiver side with the help of the WI-FI module.

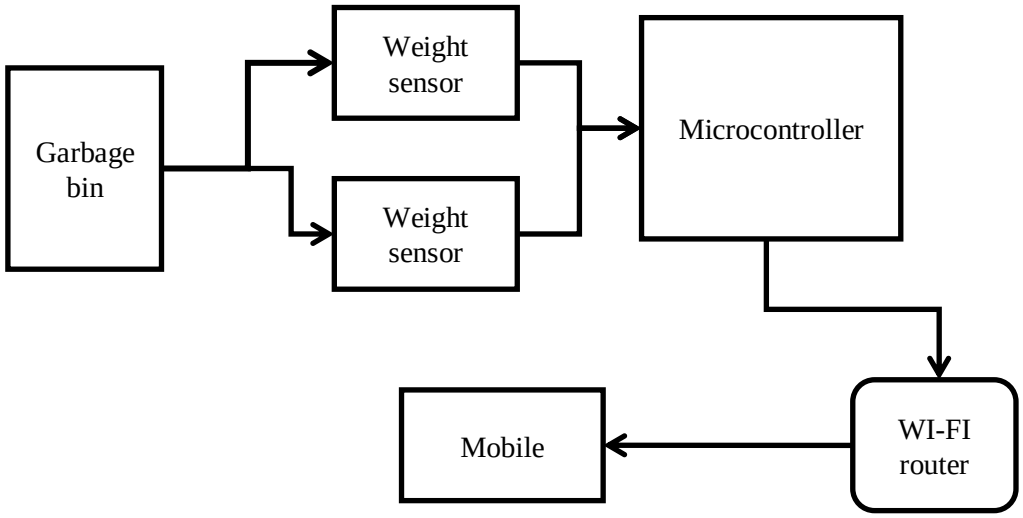

Fig 1.1 Existing System

Microcontroller ARM

The LPC2148 microcontrollers are based on the 32/16 bit ARM 7 TDMI-S^{TM} CPU.With real-time emulation and embedded trace support, which combines the microcontroller with 32,64,512KB of high-speed flash.

IR Sensors (TSOP 1738)

IR sensors indicate the level of wastes in the bin, and 3 IR sensors are fixed at different levels of the smart bin to indicate the level of wastes present.

Advantages

- It automatically monitors the level of wastes

Disadvantages

- The level of wastes cannot be detected because weight sensors are not efficient.
- It detects all the objects that come across the sensor.
- It cannot communicate the sever when the server is busy

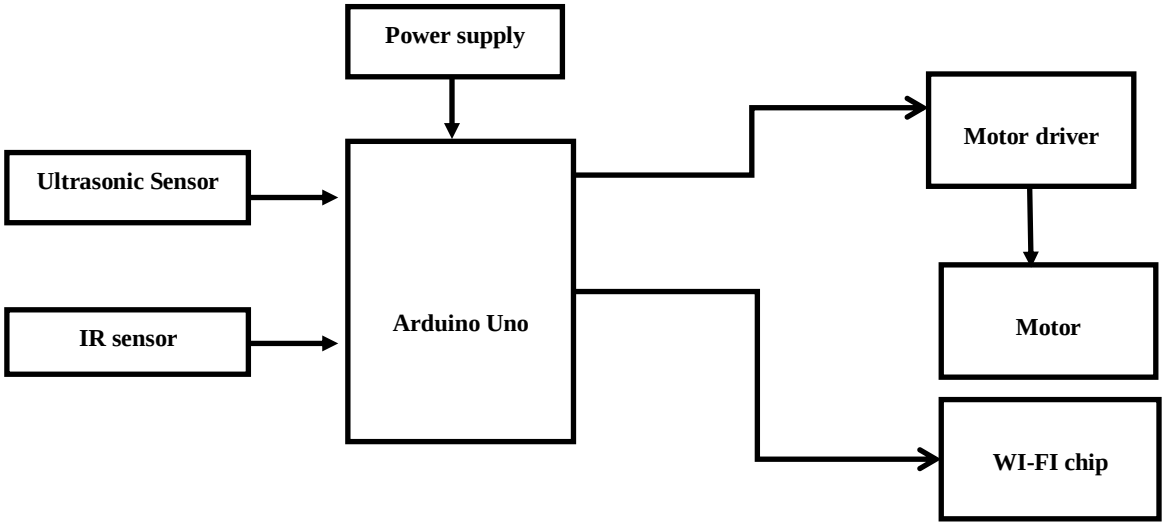

Fig 1.2 Proposed Block Diagram

III. PROPOSED SYSTEM

The current scenario shows the enormous technological development in all fields, but still, India has got its rank in major garbage producers globally. Even though the smart bin system costs high, we might reduce the costs by using the sensors by a systematic approach.

Based on the level of waste in the dustbin, we have proposed a smart waste collection system shown in fig 1.2. The sensors collect all the data and transmit it over the Internet server. The data are stored, and a processing mechanism takes place.

It helps to monitor the daily selection of waste bins for the cleaning process based on the bins' level. The workers are provided with navigational devices that show the updated information about the routes and locations in which the dustbins must be cleaned. The important characteristics of this system are that it predicts the future bin technologies regarding the factors like traffic, overcrowding, cost efficiency, and also factors that are difficult for us to calculate. Based on the analysis, the future status of the dustbin is calculated. By using the weighing sensors, the quantity of garbage is analyzed. The collection of waste should be done properly by the labor as it may cause any public hindrance.

As a result, the dustbin in the specific locations should be identified before the overflow of garbage in the dustbin.

IV. RESULT ANALYSIS

There are two sensors to detect the trashes and humans. If the person comes closer to the dustbin, it will automatically open the bin, and if the person is far away, it will close the bin. Once the garbage attains the maximum level, it readily sends the SMS to mobile.

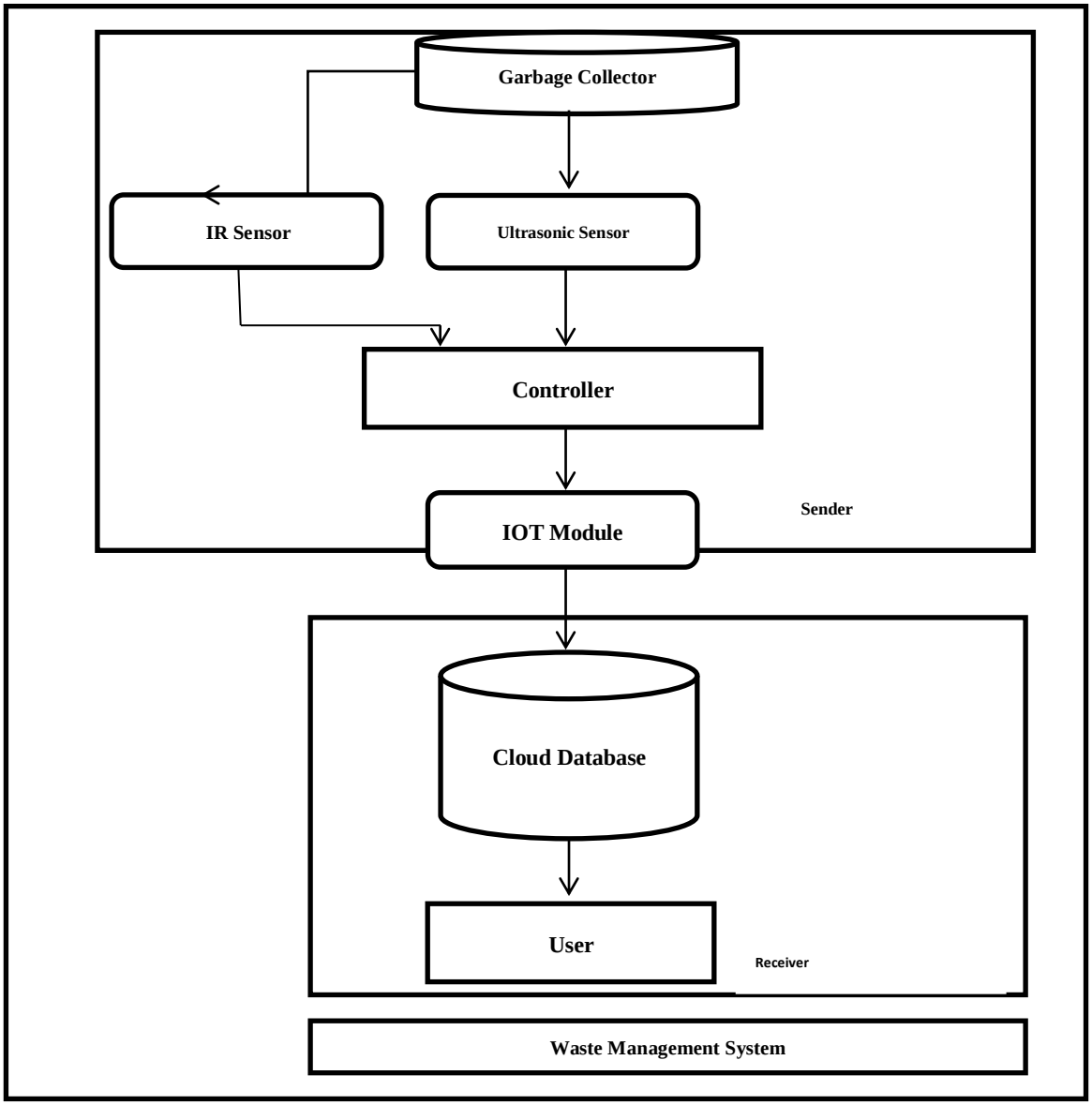

Fig 1.3 System Overview

Fig.1.4 Implementation 1

Fig 1.4 Implementation 2

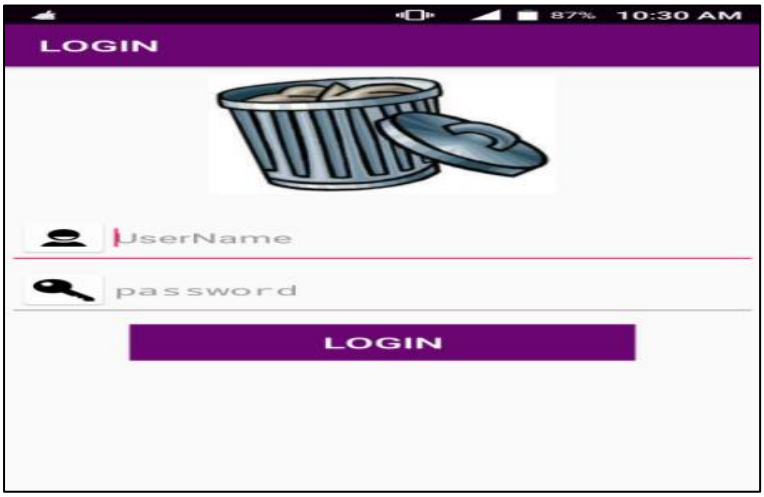

Fig.1.5 Implementation 3

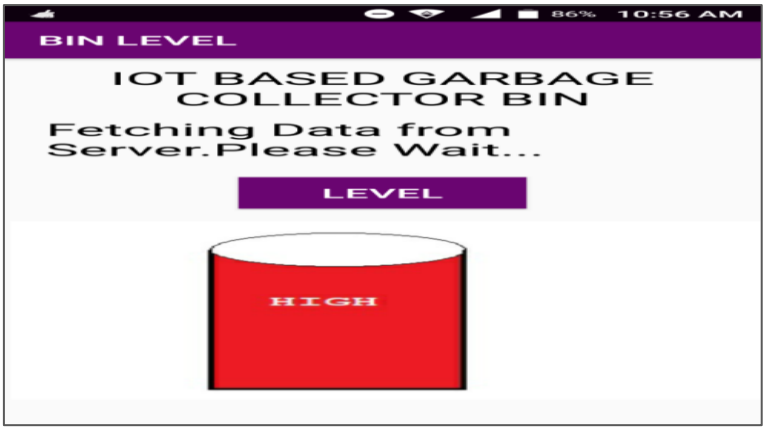

Fig.1.6 Implementation 4

The bins are made up of steel. It opens in a time delay of 5 secs once a person is near the bin. It closes after 3 secs when the trash is disposed of in the bin. You have to answer after completing the login procedure; output mechanisms take place. In the smart bin, the data should be carried out by the server for a particular time. It starts the process of finding the amount of trashes inside the bin. Once it completes the process, the level of trashes should indicate in the indicator whether it is high or not, which is shown in fig.1.6, some security questions like user name and password. While entering the details, one can log in, which is shown in fig.1.5

V. CONCLUSION AND FUTURE WORKS

We introduce a smart waste collection system that is based on the IOT sensing prototype. It has to measure the waste level and send this information to the server for the future process. This information helps the workers to find the collection routes. This paper presents the working of smart waste management systems and collects the waste as soon as the dustbin is filled.

If the dustbin is not cleaned in time, then the information is sent to the higher authority to take necessary actions. The system also helps to control the false reports and hence reduces the problem in the management system. This reduces the trips taken by waste collection vehicles to collect the waste and hence reduce the cost associated with waste collection. This helps to maintain the cleanliness in the city.

In the future, we would like to extend this system to collect different kinds of wastes such as solid and liquid wastes. The uses of solar energy are preferred for this system. This system is unsafe because this system's components can be robbed in different ways, which need to be worked on.

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