SMART DUSTBIN – SMART GARBAGE MONITORING SYSTEM

(IOT BASED)

MUHAMAD RIDZUAN BIN KAMARUDIN

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ABSTRACT

This project is to design a IoT (Internet of Things) based 'Smart Garbage Monitoring System'. The main contribution of this work is the monitoring the level of the garbage inside the dustbin by using a mobile phone and using the Blynk apps. The problem that the cleaner face today is that they need to check all the dustbin whether the dustbin is full or not. Therefore, by doing that will increase the time taken to clean the garbage and to check all the dustbin. The main objective of this smart dustbin is to monitor the garbage level inside the dustbin. This dustbin also can notify the cleaner when the dustbin is full. The output that display to the user through the LCD display is the status of the garbage. This smart dustbin used the ultrasonic sensor as the main sensor to detect the distance of the garbage inside the dustbin. The LCD display are used to show the status of the garbage. At the same time the ESP8266 are used to act as the WiFi module to send the information to the smartphone. Lastly the Blynk apps are used to get the information from the dustbin and to notifying the cleaner about the dustbin garbage. The microcontroller Arduino Uno are used as the brain of this project. For the result, the Blynk will send the notification to the smartphone and the LCD display will show the status of the garbage inside the dustbin. In this result, it contains three types of reading there are 0%, 50% and 100%. For the 0% result the garbage distance must greater than 10cm from the ultrasonic sensor. For 50 % result the garbage distance must greater than or equal to 5cm but less than 10cm from the ultrasonic sensor. Lastly for 100% result the garbage distance must less than 5cm from the ultrasonic sensor.

ABSTRAK

Projek ini bertujuan untuk membina sebuah tong sampah pintar yang mempunyai sistem pemantauan berdasarkan internet untuk segalanya (IoT). Projek ini adalah untuk membantu kerja – kerja pembersihan dengan meletakkan sistem pemantauan tenetang keaadaan sampah di dalam tong sampah dengan menggunakan aplikasi Blynk. Masalah yang sering dihadapi oleh bahagian pembersihan ialah mereka perlu untuk memeriksa setiap tong sampah bagi memastikan tong sampah itu penuh atau tidak. Hal ini akan meningkatkan masa untuk proses – proses pembersihan dijalankan termasuklah dengan masa yang diambil untuk memeriksa setiap tong sampah. Objektif utama projek ini adalah untuk melakukan pemantauan keadaan sampah di dalam tong sampah tampa perlu memeriksa setiap tong sampah. Selain itu, tong sampah ini juga akan menghantar makluman kepada bahagian pembersihan jika terdapat tong sampah yang telah penuh melalui aplikasi Blynk. Output untuk pengguna pula akan ditunjukkan melalui paparan LCD yang telah dipasang pada tong sampah. Paparan LCD akan memaparkan keadaan semasa sampah yang berada dalam tong sampah. Sensor ultrasonik digunakan sebagai komponen utama dalam projek ini untuk mengesan jarak sampah dari sensor ultrasonik. Paparan LCD pula digunakan untuk memaparkan keadaan semasa sampah yang berada di dalam tong sampah. Pada masa yang sama ESP8266 digunakan sebagai modul WiFi untuk menghantar informasi kepada telefon pintar. Akhir sekali, aplikasi Blynk digunakan untuk menerima informasi dari tong sampah pintar dan untuk menghantar makluman kepada bahagian pembersihan. Tong sampah pintar ini dikawal menggunakan "Arduino Uno" yang bertindak sebagai otak untuk mengaawal segala proses yang dilakukan. Hasil keputusan projek ini ialah aplikasi Blynk akan menghantar maklumat mengenai keadaan sampah di dalam tong sampah pintar melalui telefon pintar dan paparan LCD akan memaparkan keadaan sampah di dalam tong sampah pintar. Terdapat 3 bacaan yang dilakukan dalam projek ini iaitu 0%, 50% dan 100%. Untuk 0% jarak diantara sensor ultrasonik dan sampah mestilah lebih daripada 10cm. Bagi keputusan 50% pula jarak diantara sensor ultrasonik dan sampah haruslah lebih atau sama dengan 5cm dan kurang

daripada 10cm. Akhir sekali untuk keputusan 100% jarak diantara sensor ultrasonik dan sampah mestilah kurang daripada 5cm.

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IoT	-	Internet of Thigs
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
HTML	-	Hypertext Markup Language
IR	-	Infrared
TSOP	-	Thin Small Outline Package
DC	-	Direct Current
AT	-	ATtention
TCP	-	Transmission Control Protocol
IP	-	Internet Protocol
GPIOs	-	General – Purpose Input/output
PCB	-	Printed Circuit Board
APSD	-	Automatic Power Save Delivery
VoIP	-	Voice Over Internet Protocol
RF	-	Radio Frequency

CHAPTER 1

INTRODCUTION

This chapter will explain about the project description, problem statement, objective, scope of project, work scope and description of the methodology.

1.1 Project Briefing

This undertaking of IoT Garbage Monitoring System is a very innovative scheme which will help to keep the cities clean and jerk. This project is suitable to be used in the smart city. This arrangement monitors the garbage bin and informs about the spirit level of the garbage collected in the garbage bins via a web page. For this, the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system brand use of Arduino Uno, LCD Display, ESP8266 module and a LED. The LCD screen is used to present the position of the level of garbage collected in the bin.

A mobile phone app is used to show the level to the user whose monitoring it. The apps will provide a graphical view of the garbage bins and highlighting the garbage collected in order to show the level of garbage collected. It is shown by the LCD screen. The system will put on the LED when the level of garbage collected crosses the set bound. Thus, this system helps to keep the city clean by informing about the garbage spirit level of the bins by providing a graphical image of the bins via mobile app.

1.2 Problem Statement

The human resource such as plastic bag always wasted when the cleaner need to clean up the dustbin although the dustbin is not full. Besides that, when the dustbin is full the user still throws the garbage at the dustbin. The cleaner cannot monitor the current level of garbage in the dustbin so the time to check all the dustbin is wasted [1].

Figure 1.1 Garbage In Office

Figure 1.2 Garbage In Hospital

1.3 Objective

There are several objectives such as:

1. To design the IoT – based 'Smart Garbage Monitoring System' that detect the level of the garbage in the dustbin.
2. To monitor the level of the garbage at the dustbin through LED.
3. To notify the cleaner about the garbage level of the dustbin by using mobile apps.

1.4 Scope of The Project

The main function of the prototype of this project is to monitor the garbage in the dustbin. The reading of the dustbin shown on the smartphone by using mobile apps displays the level of the dustbin to notify the person in charge when the dustbin is full. Besides that, the dustbin also has the LED to tell the people when the dustbin is full.

The main components are the Arduino Uno. This Arduino Uno acts as a head for the ultrasonic sensor, LCD monitor, and the LED. The ultrasonic sensor is made by level for the dustbin, so it will show the level of the dustbin at the mobile apps. The LCD monitor also functions the same as the LED that shows when the dustbin is full.

For this project, the prototype constructed is meant for crowded hospital that has many levels. It also can be applying to the office building that has multilevel.

The hardware required for this project are Arduino Uno, ultrasonic sensor, WiFi module ESP8266, LED, LCD display, resistor and servo motor. The apps used is the Blynk. The cost of this project is about RM 170.00.

1.5 Thesis Organization

Chapter 1 explains about the introduction of the project the contains the problems statements, objectives, and the scope of work. Chapter 2 explains about the literature review of the other papers that related with this project. Chapter 3 explains about the

methodology of this project that contains the flow chart, list of the equipment component description and component structure. Chapter 4 explains about the result of these project that get after we are doing several experiments. Lastly, chapter 5 explains about the conclusion and recommendations of these project.

CHAPTER 2

LITERATURE REVIEW

In this chapter reviews from other papers are auditing to identify the research gap.

2.1 Literature Review of Current Project

For every project that has been done successfully, studies and reference have been done as guidelines. All the guidelines come from various sources and references such as books, articles, journals, and the internet. These sources play a vital role in making this project successful. All the information highlights major areas that are related and will be used in the software and hardware of this project.

2.1.1 IoT Based Waste Management for Smart City

This project is done by Parkash and Prabu from National Institute of Electrical and Information Technology, Calicut, Kerala, the Republic of India in February 2016. This project combines 8051 microcontrollers, IR sensor, RF module, Intel Galileo Gen2. In this projected system, they proposed the low cost embedded system to make the truck located the dustbin through the city or Campus[2]. The dustbin also has the unique ID that makes it easy to identify when the garbage is full. The detail can be access by the concern authorities from their place by using the Internet and they can give the immediate response to clean the dustbin. Figure 2.1 illustrate the flow chart of the transmitter and receiver of this project. Figure 2.2 shows the information access of the client in this project.

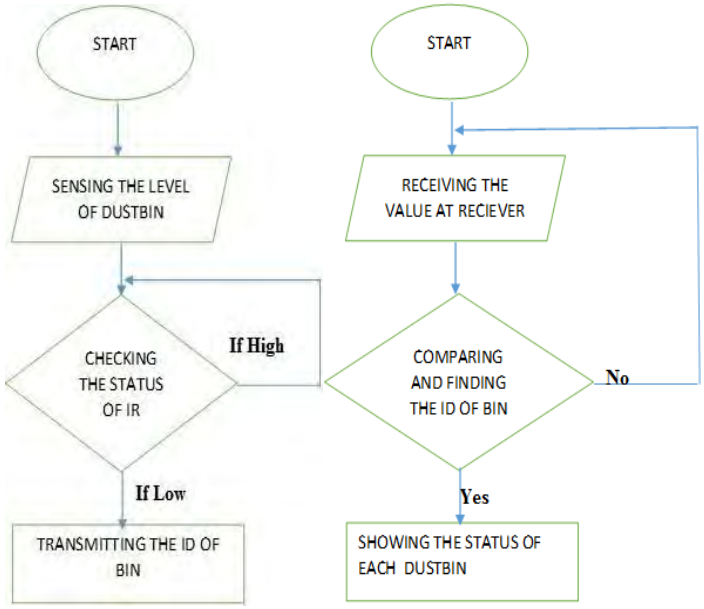

Figure 2.1 Flow Chart Transmitter and Receiver

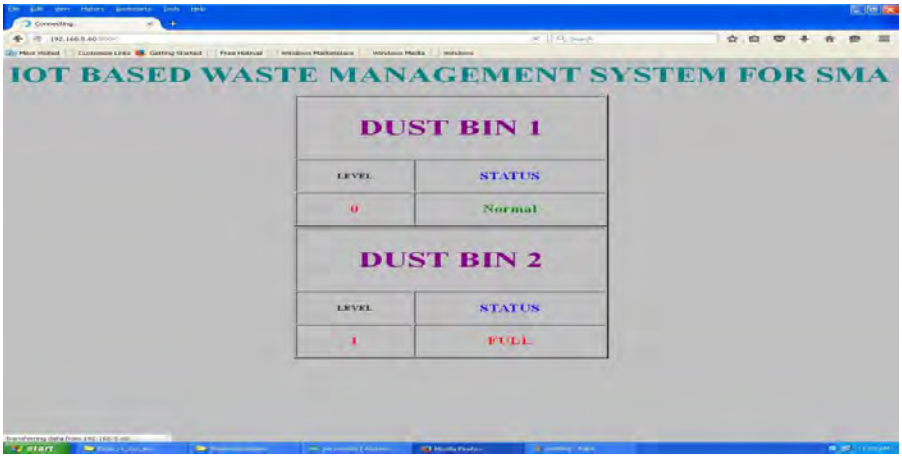

Figure 2.2 Information Access Client

2.1.2 IoT Based Smart Garbage and Waste Collection Bin

This project is done by S.S Navghane, M.S Killedar and Dr.V.M Rohokale. The article is published in May 2016. These dustbins are interfaced with microcontroller ARM

(LPC2148) based system and having IR wireless systems along with central system showing the status of garbage, on a mobile web browser with HTML page by Wi-Fi [1]. This project also has used the combination of a weight sensor and IR sensor to detect the amount of garbage in the dustbin and to give the information about the dustbin status. Hence the status will be updated on the HTML page. The main part of this project depends upon the working of the Wi-Fi module; essential for its implementation. Figure 2.3 (a) shows the transmitter block diagram of this project, while Figure 2.3 (b) shows the receivers block diagram for this project

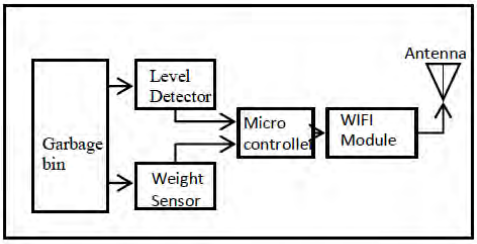

Figure 2.3 (a) The Transmitter

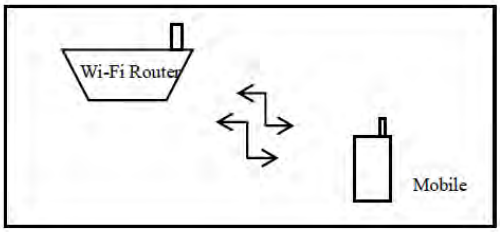

Figure 2.3 (b) The Receiver

2.1.3 Smart Garbage Management System

This project is done by Vikrant Bhor, Pankaj Morajkar, Maheshwar Gurav and Dishant Pandaya. It is published on March 2015. The project is about combining the Arduino Uno Board as the microcontroller and the IR sensor for the detection of garbage. For the receiver part, this project has used the TSOP1738 [3]. The output of this TSOP1738 is connected to the Arduino UNO Board. The GSM is used for the transmitter section compare to the ZigBee. Figure 2.4 (a) and Figure 2.4 (b) illustrate the transmitter section and receiver section of these project.

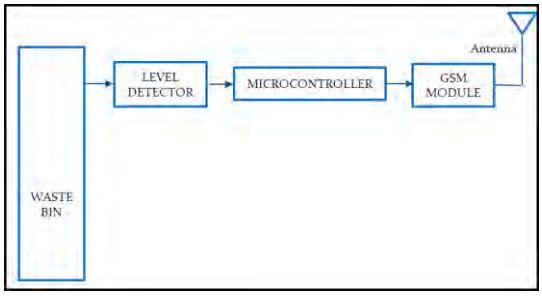

Figure 2.4 (a) Transmitter Section

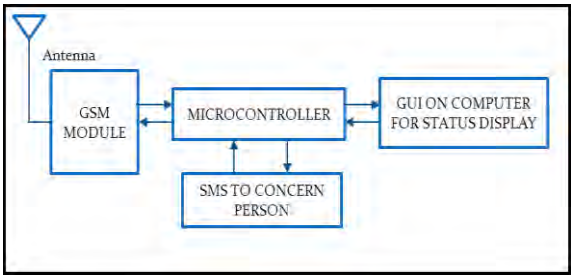

Figure 2.4 (b) Receiver Section

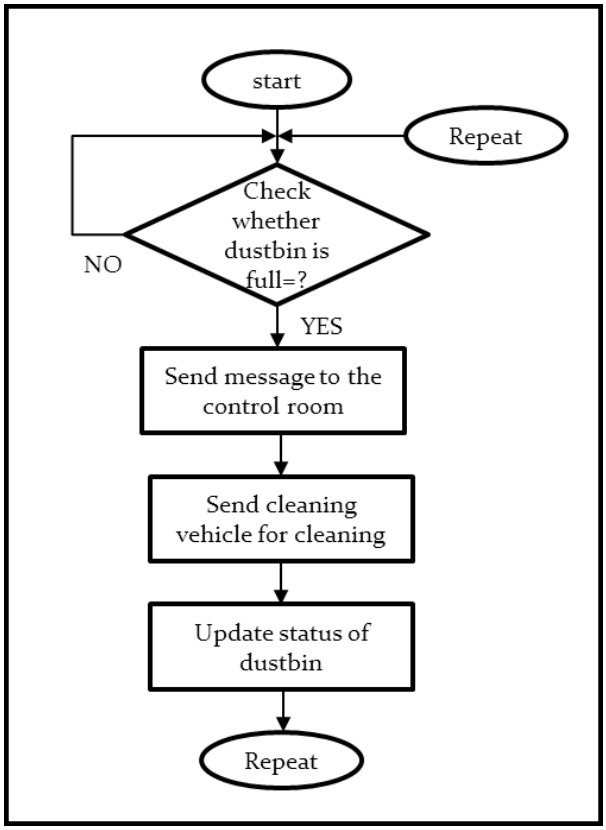

Figure 2.5 Flow Chart Project