UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART BILLING TROLLEY SCANNER USING RFID AND ARDUINO

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Industrial Electronics) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Industrial Electronics) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Perubahan dan cabaran teknologi yang pesat dari Revolusi Industri 4.0 pasti akan memberi kesan langsung dan berkekalan pada masa depan dunia. Terdapat banyak inovasi baru yang diharapkan dapat mengubah gaya hidup manusia dalam era teknologi yang semakin meningkat ini. Selama beberapa dekad yang lalu , perubahan teknologi telah berkembang pesat dan negara Malaysia tidak ketinggalan dengan perubahan ini dengan melancarkan inovasi yang memberi manfaat kepada masyarakat. Walau bagaimanapun, teknologi yang digunakan di pasar raya Malaysia masih tidak sebanding dengan negara-negara membangun seperti Jepun. Pengguna masih perlu beratur di kaunter pembayaran dan memerlukan waktu yang sangat lama untuk membuat pembayaran. Di samping itu, pengguna mungkin sukar mengetahui harga barang yang dijual di pasar raya. Kadang- kala, harga yang dipaparkan di rak tidak sesuai dengan harga sebenar. Ini menyukarkan pelanggan untuk mengehadkan perbelanjaan mereka. Oleh itu, pengimbas troli penagihan pintar menggunakan RFID dan Arduino akan menyelesaikan masalah pengguna Malaysia ini. Troli pintar ini akan dilampirkan dengan pengimbas RFID, skrin LCD dan diprogramkan oleh Arduino. Ini akan memudahkan pembeli untuk mengira keseluruhan nilai pembelian mereka dan membuat pembayaran di kaunter tanpa mengambil masa yang lama.

ABSTRACT

The rapid technological changes and challenges of the Industrial Revolution 4.0 will surely have a direct and lasting impact on the future of the world. There are many new innovations that are expected to transform human lifestyles in this growing age of technology. Over the past few decades, technological change has been growing rapidly and the Malaysian nation has not missed out on this change by launching innovations that benefit the peoples. However, the technology used in Malaysian supermarkets is still not comparable to developing countries like Japan. Consumers still have to queue at the payment counter and take a very long time to make a payment. In addition, consumers may find it difficult to know the prices of goods sold in supermarkets. Sometimes, the prices displayed on the shelves are not in line with actual prices. This makes it difficult for customers to limit their spending. Thus, the smart billing trolley scanner using RFID and Arduino will solve this problem of Malaysian consumers. This smart trolley will be attached with RFID scanner, LCD screen and be programmed by an Arduino. This will build it easier for shoppers to calculate the whole worth of their purchase and might still build payments over the counter while not taking abundant time.

DEDICATION

To my beloved parents Halim Bin Saffien and Siti Fatimah Binti Yakob.

To all my supported semester friends for their Love, Sacrifice, Wishes and Encouragements

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LIST OF SYMBOLS

Cm   -   Centimetre

kHz   -   Kilohertz

mm   -   Millimetre

ms   -   Milliseconds

V   -   Voltage

MHz   -   Megahertz

LIST OF ABBREVIATIONS

UTeM   Universiti Teknikal Malaysia Melaka

IoT   Internet of Things

RFID   Radio Frequency Identification Reader

IDE   Integrated Development Environment

LCD   Liquid Crystal Display

PWM   Pulse Width Modulation

UART   Universal Asynchrous Receiver Transmitter

SPI   Serial Peripheral Interface

DC   Direct Current

LED   Light Emitting Diode

IR   Infrared

RF   Radio Frequency

USB   Universal Serial Bus

ID   Identification

GSM   Global System for Mobile communication

ICSP   In-circuit serial programing

Tx   Transmitter

Rx   Receiver

SEL   Select

EEPROM   Electrically erasable programmable read-only memory

PB   Push button

CHAPTER 1

INTRODUCTION

1.1   History of the project

The quick technological changes and challenges of the Industrial Revolution 4.0 will surely have a direct and lasting impact on the future of the world. There are many new innovations that are expected to transform human lifestyles in this growing age of technology. Over the past few decades, technological change has been growing rapidly and the Malaysian nation has not missed out on this change by launching innovations that benefit the peoples.

The use of technology today has great impact on society and the surrounding. The use of technology can also help people to complete their tasks in a shorter and more time efficient. Therefore, with the use of technology, human life will be easier and easier. Now days, there are many technologies that give benefits to mankind such as smart watch, smart home and everything that use internet of things(IOT). However, the technologies used in shopping malls in Malaysia are still left behind and not have so much improvement.

Shopping malls are the place where people find and buy their needs such as daily basis, clothing, foods, gadgets and so on. Before the modern technology, only calculator is used to calculate the total price of thing that consumer buy. Then, the technology is upgraded and used barcode to scan and total up the price. With the improvement of technology used, it has reduced the problems but not totally solve the problems. Usually, consumers will face

many problems when they want to shop at the shopping malls. Lack of budget or spending beyond the planned limit is one of the problems consumers face when shopping in the supermarket. The lack of information about the price of the product also contributes to this problem. Besides that, consumers also need to face a long queue before they can make any payment at the counter.

The development of this smart trolley designed to help consumers when shopping in the shopping malls without worrying about the long queue during payment at the counter and overspending due to lack of information price about products. By using this trolley, consumers will easily limit their spending and know the total price of their spending. Moreover, they does not need wasting their time line up at the counter just to complete the payment.

1.2   Problem Statement

Shopping is something that every consumer in Malaysia often does. It is an activity that you have to do to buy something you want. Shopping is arguably one of the most common routines of consumers in Malaysia. While this routine is a favorite of most users, there are a few things that are very annoying that every user wants to avoid. One of the most common problems consumers face is having to go through a long queue before making payments for their purchases. This long queue makes users unhappy and may anger some who are impatient. This long queue always happens at every payment counter because cashiers get bulk purchases and need to scan each of these items using a barcode scanner system. So this can take a long time and is less effective method.

In addition, consumers also have trouble buying items beyond their budget or overspending issues. This issue always happens because they does not calculate the total price of items that they want to buy. For cash-only users, this can be a major issue when there is insufficient cash when it comes to making payments over the counter. When the money was not sufficient, the goods to be purchased had to be canceled and it would take time. Indirectly, it causes users behind to wait longer to make their payments. It will also make the queue become longer.

Another problem when shopping is that consumers find it difficult to get a good price quote. Sometimes, the prices displayed on the shelves are out of order and a bit confusing to the consumer. There are also consumer who misread the price tag because they want to catch up on time and have to rush to buy something. Somehow, this problem also will lead to overspending issue just now.

All of these issues will become worst when it came to promotion day, big sale or weekends. At that time, cashier caseloads will face more purchases from customers and will need to scan each item using a barcode scanner before consumers can make payments. All of this problem can be overcome by using this RFID smart trolley. It also will increase the shopping experience by each consumer and feel satisfaction while shopping.

1.3   Objective of Project

1. To design and develop smart billing trolley scanner by using RFID and Arduino.
2. To develop a smart trolley over-spend detection system to reduce the risk of over-budgeting during shopping.
3. To analyze the efficiency of RFID scanner based on repeatability.

1.4   Scope and Limitation

This Smart Billing Trolley Scanner by using RFID and Arduino will be design to able scanned several RFID tag to detect the price of products based on data of item enter in the programed. It must be able to scan the item continuously to prove that this RFID scanner have more durability than other scanner out there. In this system design, the step of billing process is to detect the product which is each of product will have the RFID tag that have a unique code. When the item is scanned at the EM-18 module reader, the reader will read the unique code at the item and transfer the product code to Arduino Uno processor to be process. When the unique code from the RFID tag is same with unique code programmed in the coding, the buzzer will beeping and the servo will open the smart trolley's door. Then, the LCD screen will display the name of item, price and total price of all item in the smart trolley. The limitation for this smart trolley is it only detect low range frequency RFID tag which is 125 kHz. This low range frequency RFID have minimum distance detection which is below 10 cm range from the EM-18 module reader. So, user must put the product with RFID tag at least in the distance range to get detected with the EM-18 module reader.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Within this chapter, as far as the literature review is concerned, it will explain that it includes the knowledge gathered within order to obtain information and principles when the research is over. There are many sources use. These include books, thesis, journals and websites, that have been taken as a resource. The development of the circuit, the hardware and the software system, which is useful in the project, has been completely integrated. Besides that, throughout this chapter together build a study relating to several project that related to produce some improvement or take some set up from the other project. It's useful to complete a project that has created.

The major purpose of this review of literature is to understand what knowledge and concepts developed regarding the RFID system and which could also be simply found by looking through newspapers, tools, conference articles, books of reference, and past research papers. It may show strength and weakness together of that framework.

This project was replaced with the new scan malls program which exploited the technology of barcode. With this new transposition the system which uses RFID technology benefits a lot of shoppers while shopping, and manually updating the product system. Any item on the food market should have a universal product code that enables the consumer to decide the merchandise to check the barcode. Barcode scanner help hooked up to the contain information in appearance. Once the barcode is scanned, the principal points and also the

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value of the barcode. The product is shown on the bit monitor in conjunction with the complete bill of the purchased items.

2.2 Comparison between RFID and barcode scanner

We see that later RFID are widespread and it comes because of its swift and efficient response to play a role in many advanced ones. RFID are usually tags that are used by victimization radio waves for the distinctive recognition of products.

The RFID based systems have been developed in in which RFID tag reads the information of products and are transmitted through the server to the main billing computer. (Bhagyashreer Bhumkar, 2014). The emergence of new technologies, such as Radio Frequency Identification (RFID) and wireless networks, makes the traditional retail processes faster, transparent and efficient. (Rajesh Nayak, 2017). RFID reader consists of an RF module that acts as a transmitter and receiver of radio frequency signal. (Kalyani Dawkhar, 2015).

Tags systems are currently classified into three different passive, active and semi-passive types. Passive tag need not have sources of strength. The antenna on the passive tag is however very important to connect the reader as a result of the reader's magnetic or magnetic force field can provide all the ability to operate the tags. In the meantime active tags provide their own energy.

Barcode could be a pattern of bars and areas with completely different dimensions wherever the digits, letters, or alternative symbols are represented. This technology will be used to determine value or name of a product. Each barcode contains code which works as tracking technology for products, is represented in sequence of lines. (Rajesh Nayak, 2017). This technology contains two different characteristics to determine start and end or start and