Development Wireless Radio Frequency Identification (RFID) connector to reduce the use of wire harness in order to minimize frequents connection failure

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This Report Is Submitted In Partial Fulfillment of Requirements for the Bachelor Degree of Electronic Engineering (Wireless Communication)

Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
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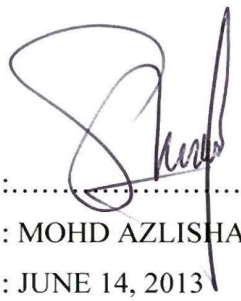

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ABSTRACT

At present various switch control system technology is introduced. As in the industrial control system plays an important role. In heavy industry there is a lot of equipment or instrumentation that must be controlled by one control center. When too much equipment or instrumentation needs to be controlled that mean installation using wire harness also needed. The increase the number of system that also increase the use of wire to make connection. Use of lot wire to make connection can make a messy workspace or industry. This matter also can increase use of space in the industry. A wireless communication can be used to remove wire connection between machine and control terminal. This final year project will discuss about an application of wireless communication to minimize the use of wire harness. In this project, ZigBee will be used as a wireless device to replace existing wired communication system. By using this system, the process of installation is easier and it is also cheaper for installation and maintenance process. This projects is combination of hardware and software and student focus on developing minor part of software and major part of hardware.

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CHAPTER I

INTRODUCTION

1.1 Project Introduction

RFID technology has yet to be realized because of the inconvenient and costly implementation prescribed by the necessity for a wired infrastructure to transmit valuable data to a central location. In order to advance this technology, this project designed and implanted a proof-of-concept wireless RFID reader system.

This will create interface via Wireless and can communicate with a controller by using the ZigBee standard. The prototype can be created by using hardware and software. The first step in allowing controller and RFID readers to communicate wirelessly is to choose protocol to use.

The relatively new ZigBee standard, specified by IEEE 802.15.4, is suitable because it is designed for low cost and low power applications in particular. Choosing a standards based technology over a proprietary solution is beneficial because it offers more flexibility and universal functionality.

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ZigBee was determined to be the appropriate solution because Wi-Fi and Bluetooth were more expensive and higher power consumption due to the bandwidth and system restore offered.

1.2 Problem Statement

Nowadays, several industries have problems with production line due to frequent connection failure between hubs with main controller. The problem usually occurs due to a lot of industries still using wired connection between main terminal and controller.

For example the industrial sector, the RFID system is usually used to make an access to some building. RFID also had been used for employee attendance. RFID system also can be used to control main system switch. All these system must be maintained within certain time. Every maintenance work should have wage costs to it. Maintenance costs are usually high, depending on the system installed and the expertise needed to carry it out.

Intermittent problem always occur after most maintenance depending how much the wire harness on the system. This problem happens due to wires being misplaced during the maintenance. In addition, poor wire harness system can also contribute to this problem.

Silterra Sdn Bhd, a silicone based foundry industry, also have similar problem. Their major problems in the production lines are frequent connection failure between machine and controller due to wire harness.

Hence, the creation of RFID switch controller system using wireless is more economical than the previous system as it does not require expertise to carry out the maintenance job. Minimized wire harness used on the system makes its installation cost more affordable.

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1.3 Objective of Final Year Project

Projek Sarjana Muda (PSM) is a requirement in order for a student to be awarded a degree by UniversitiTeknikal Malaysia Melaka (UTeM). This project will be carried out during the final year. In this project, student will work individually with supervision from the lecturer of their respective department.

The aim of PSM is to provide the opportunity for student to apply and integrate theoretical knowledge and principles taught in the course in solving technical problems. It also provides the opportunity for the students to demonstrate independence and originality, as well as to plan and organize project over a certain period of time.

Throughout this course, student should also be able to:

i) Document all findings and problem encountered.
ii) Apply practical hands-on techniques in process, quality control and related analysis in their specialized program.
iii) Demonstrate the procedures and methods of project implementation.
iv) Execute the sequence in various steps required to produce, manufacture and test, solve or improve the real life industrial projects problem.
v) Analyze findings and results of the project.
vi) Produce a technical report and make a presentation

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1.3 Objective

There are several objectives regarding to the undergoing project that need to be given attention in order to ensure all the procedures and efforts to be made are in accordance to the aims of this project. The followings show major objectives of the projects:

i. To reduce cabling that may interfere with maintenance works.
ii. To solve intermittent communication problem between RFID terminals and its controllers system.
iii. To establish intermediate wireless communication using ZigBee communication standard.

1.4 Scope of Work

Using ZigBee communication system

- In this project, ZigBee communications system had been used. For example, an electronic wireless module called "Xbee" can be used to create a wireless communication system in this project.

Creating wireless communication

- In this project, the frequency of 2.4 GHz wireless standard had been used to create an interface between RFID terminals with the main system controller.

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Using 8H10D RFID reader

- In this project this type RFID was selected because of this factor:
  i. Low cost solution.
  ii. Proximity desktop reader for card issuing.
  iii. Support EM4100/Proximity, RT55x7 or compatible technology.
  iv. USB/RS232 interface for ease of use.
  v. Economic and compact design.

1.5 Report Structure

This thesis is a combination of 5 chapters consist of the introduction, literature review, methodology, results and discussion and the last chapter is conclusion and recommendation for the project.

Chapter 1 is an introduction to the project. It explains the background, objectives and the concept. In addition, the overall view of the project will also be discussed in this chapter.

Chapter 2 focuses on the literature review and the project flow for the development of the Home Controlling System by Using Voice Recognition (Via ZIGBEE and RF Remote Circuit).

Chapter 3 will explains the project methodologies. It discusses project activities such as workflow, procedure, block diagrams and methods used in order to develop this project.

Chapter 4 will define the final result of the project starting from designing until the implementation of the system. It discusses all the results obtained, problems/errors faced, inspection and troubleshooting and the solutions.

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Chapter 5 discusses the conclusion and recommendations for the project. The project was successfully designed and proven with the expected result. This system can be retested to be improvised with certain recommendation to ensure the system runs more efficient and reliable.

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CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter includes the background study regarding home automation concept, journal, and related previous projects and thesis. It also discusses on the component that are used in the project

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2.2 ZigBee Enabled RFID Network by Dr. John Bellantoni, Liaison

The Developing technology of Radio Frequency Identification (RFID) promise to be a wide-ranging method to data collection. One of its possible applications includes the improvement of supply-chain operations, offering a more automated and informative alternative to barcode. RFID technology is an identification technique that remotely reads data stored on devices RFID tags using interrogator devices called RFID readers. Each tag holds an identification number, a unique value attributed to it. Collecting these IDs in a central location has the possible of allowing a virtual sign of up to date inventory[1].

As extensive as the promises of the technology are, they are limited by the expected difficulties of implementation. Setting multiple RFID readers are compactly distributed throughout a store with a single central node to the network and manage the massive amount of data collected. Multiple RFID readers transmitting their data to the central node through hardwired connections, installing a complete wired infrastructure is necessary to accommodate the data transmission. This will effect increasing the installation cost and the difficulty of implementation, detracting from appeal of RFID.

To solve this matter is allowing the central node and readers to communicate wirelessly. The new ZigBee communication standard specified by IEEE 802.15.4 is suitable because it is designed for low cost and low power applications. ZigBee was determined to be the appropriate solution because Wi-Fi and Bluetooth were more expensive and has higher power consumption.

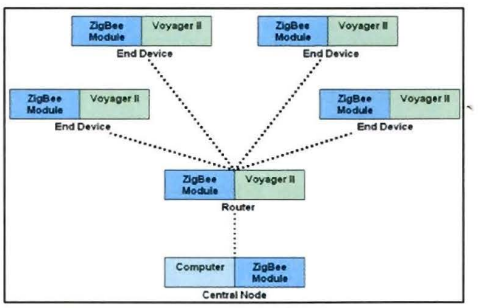

Figure 2.1: Diagram of Wireless RFID Network [1]

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2.3 Design of an RFID / ZigBee Network by Rangakrishan Srivinisan

By using IEEE 802.1.4 ZigBee based transceiver and RFID tags would be used to integrate this wireless network solution. Navigation and Communication Network system are very crowded and which they happen visit infrequently, like an airport, continue to be a nightmare. The project incorporates a RFID / ZigBee based navigation system for such navigation [2].

The desired network would contain of reduced function nodes (RFID tags), active nodes (ZigBee transceivers) and user friendly device (RFID/ZigBee compatible dual-mode transceiver). Passive RFID tags would be used for providing information on location and Active ZigBee transceiver would provide real time information.

IEEE 802.15.4 ZigBee is a reasonably new standard established to encounter the need of low data rate, low power consumption based wireless network. Machine to machine system remove the user effort and try to form a network automation, environmental control, control, health monitoring or security purpose.

2.4 ZigBee Wireless Vehicular Identification and Authentication System

ZigBee is a lately established wireless technology used in many commercial and research application. Based on the IEEE 802.15.4 specification, it has become a very attractive wireless connectivity answer due to its open standard, low-cost and low power consumption applications in comparison with other wireless technologies [3]. Can be used in many application include home and building automation, industrial control, building management systems, environmental monitoring, vehicle fleet management systems etc.

This project proposed a system using ZigBee wireless RF tags to identify and authenticate vehicle entering premise. The Design consists of RF vehicle tags containing information of the vehicle.

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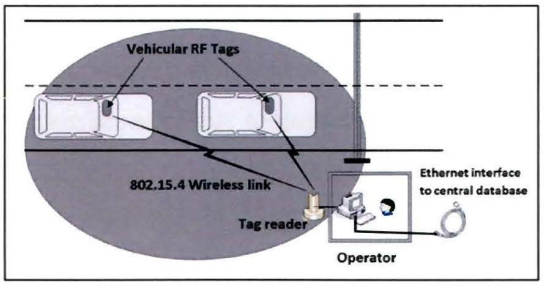

Figure 2.2: System Model [3]

2.5 RFID and ZigBee Based Manufacturing Monitoring System

Traditional methods of monitoring production in enterprises by humans on site are unable to meet the expectations for efficiency, accuracy and cost as product lifecycles are shortened continuously. Setting up an RFID and ZigBee based manufacturing monitoring system is a good approach to improve monitoring efficiency so as to improve management efficiency in enterprises [4]. Although there are still some problems to be solved for RFID and ZigBee technologies, their unique features still make the monitoring system based on them a promising system in manufacturing enterprises.

2.6 Smart Home: RFID Access Control and Automated Lighting System by Philip Robinson, David Meyers, Nazar Trilisky, Jared Santinelli.

This project system is about RFID access control and automated lighting system that offer ID based entry into a building and trigger the activation of a user matched lighting system. The system use a RFID authentication mechanism to communicate with microcontroller that will release the approve system [5].

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