

SMART DETECTOR DATABASE USING RFID


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“I recognize this report is the result of my own work except for a summary and quote
of each of them I have mentioned the source”

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ABSTRACT

A Smart Detector Database using Radio Frequency Identification (SDDR) is a cyclist tracking device. This device can be applied in the biggest race competition, such as in the *Le Tour De Langkawi* (LTDL). Today's monitoring system is unable to trace non-arriving cyclists. As a solution, SDDR will detect cyclists that pass through the checkpoints and the profile about that cyclist would be displayed at the organizers' PC monitor at the last point. The profile of each cyclist can be identified by using the information from the database. The information from the Radio Frequency Identification (RFID) Database Handling System will be used by the organizer such as name, address, date and time of arriving at each checkpoint. The main purpose of this device is to reduce the use of manpower at each checkpoint. The aim of this project is to implement the RFID tags and readers as a detector. This project will use the Ultra High Frequency (UHF) RFID Reader that will be directly connected to the PC organizer without using the interface circuit. This system has been developed by using Microsoft Visual Basic (VB) that offered a graphical user interface (GUI) for displaying the result. The database as well as support for this system is Microsoft Access (MA). The purpose of the database is to be a reference for any related stored data and information. Implementation of this smart detector involves low cost, long read range and high read rate. The successful implementation for this project will save time, cost and energy.

ABSTRAK

Smart Detector Database using Radio Frequency Identification ataupun boleh dikenali sebagai *SDDR* adalah sebuah alat pengesanan pelumba berbasikal. Alat ini boleh diaplikasikan semasa pertandingan atau perlumbaan basikal yang besar berlangsung seperti *Le Tour De Langkawi (LTDL)*. Hari ini, sistem pemantauan yang digunakan tidak dapat mengesan pelumba yang tidak sampai ke garisan penamat. Sebagai penyelesaian, *SDDR* digunakan untuk mengesan pelumba yang melalui pos pemeriksaan ataupun tempat pemeriksaan dan maklumat diri pelumba akan dipaparkan di skrin komputer pihak penganjur yang terletak di garisan penamat. Butiran terperinci mengenai setiap pelumba boleh dikenal pasti dengan menggunakan maklumat daripada pangkalan data. Maklumat daripada Pangkalan Data Pengendalian Sistem Identifikasi Frekuensi Radio (RFID) akan digunakan oleh pihak penganjur seperti nama, alamat, tarikh dan waktu ketibaan pelumba di setiap tempat pemeriksaan. Tujuan utama alat ini adalah untuk mengurangkan penggunaan tenaga kerja di setiap tempat pemeriksaan. Matlamat projek ini adalah untuk melaksanakan penggunaan tag dan pembaca bagi RFID dalam bidang pengesanan. Projek ini akan menggunakan Pembaca UHF yang akan dihubungkan terus kepada komputer penganjur tanpa menggunakan sebarang litar antaramuka. Sistem ini akan dibangunkan dengan menggunakan *Microsoft Visual Basic (VB)* yang menawarkan Antaramuka Pengguna Grafik atau *Graphical User Interface (GUI)* untuk memaparkan keputusan. Pangkalan data sebagai sokongan untuk sistem ini menggunakan *Microsoft Access (MA)*. Tujuan pangkalan data adalah untuk menjadi rujukan bagi mana-mana data yang disimpan dan maklumat yang berkaitan. Pelaksanaan pengesanan pintar ini melibatkan kos yang rendah, jarak bacaan yang jauh and kadar bacaan yang tinggi. Jika projek ini berjaya dilaksanakan, ia pasti akan menjimatkan masa, kos dan tenaga.

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LIST OF ABBREVIATIONS

SDDR	Smart Detector Database using RFID
RFID	Radio Frequency Identification
ID	Identification
UHF	Ultra-high frequency
VB	Visual Basic
MA	Microsoft Access
GUI	Graphical User Interface
LTDL	<i>Le Tour De Langkawi</i>
PC	Personal Computer
TNC	Threaded Neill-Concelman connector
N	Neill connector
LAN	Local Area Network
UWB	Ultra-wideband
IFF	Identification, friend or foe
WWII	World War II
FCC	Federal Communications Commission
EPC	Electronic Product Code
DoD	U.S Department of Defence
MSSI	Multispectral Solutions Inc.
RF	Radio Frequency
LF	Low Frequency
HF	High Frequency
CRC	Cyclic Redundancy Check
VSWR	Voltage Standing Wave Ratio
IDE	Integrated Development Environment

RAD	Rapid Application Development
Tx	Transmitter
Rx	Receiver
XML	Extensible Markup Language

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CHAPTER I

INTRODUCTION

1.1 Project Background

Nowadays, to make the biggest race competition such as *Le Tour De Langkawi* (LTDL) games run smoothly, a lot of manpower are needed at the behind the screen to control that events. It will involve high cost, waste time and also a lot of energy used during the games. A Smart Detector Database using Radio Frequency Identification (SDDR) is a cyclist tracking device that has been developed to overcome this problem. Radio Frequency Identification (RFID) technology is used to identify anything by using a radio signal frequency. Basically, this project will manage a system with information of cyclists to detect them through the checkpoint and it will link to its own database. The information will be provided in the database such as name, address, date and time of arriving of cyclist.

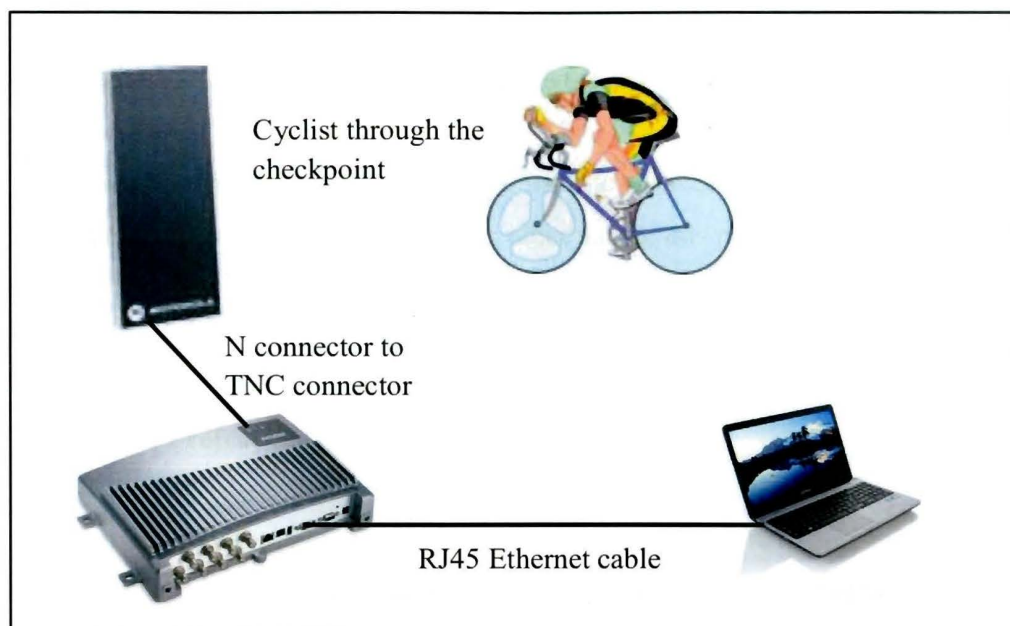


Figure 1.1: The connection of RFID system

Figure 1.1 shows the RFID system connection between the transponder and the reader in this project. When the cyclist passed the antenna that installed at the each checkpoint, the antenna will capture the data that carried in the tags and send to the RFID reader through the antenna cable. The data will transferred to the PC monitor from the RFID reader through the RJ45 Ethernet cable. Lastly, the information of cyclist will displayed at the organizer PC monitor.

This project can be used to manage the systems that detect the cyclist arrived at the checkpoint. Furthermore, this system also helps the organizer to knows where the last checkpoint of cyclist pass through and which the checkpoint they do not through it. By the means of that, organizer could track who is missing during the events. If they need an assist, the rescuing team will send to find them faster.

There are three parts in the RFID system. The first part is a scanning antenna which is RFID reader, the second part is a transceiver with a decoder to interpret data and the last part is a transponder (RFID tag). This system has been developed using Microsoft Visual Basic (VB) that offered graphical user interface (GUI) for display

the result. The supported database in this system is used Microsoft Access (MA). The purpose of this database is to be reference of any related stored data and information.

The improvements of this system can be used to overcome the limitation of manpower to guide an each checkpoint. On the other hands, this project can monitor for each cyclist that through the reader.

1.2 Objective of Project

This project has three main objectives that related to the software and the hardware system. These objectives will be the reference during the development of the project. The successfulness of this project are depending on the achieving these objectives. The objectives listed are:

1. To implement the RFID tags and readers uses as a detector.

The first objective is to design the Smart Detector Database using RFID by implement the RFID tags and readers. It will uses as a detector in this project. The development of this project can overcome the limitation of the detection security in monitoring system.

2. To learn the VB language that use for GUI system to display at the PC monitor.

The second objective of this project is to learn the VB language. This language can be used as interfaces by using the GUI system and will display it at the PC monitor. The software part will covers all the important data about the cyclist such as their profile and the time arriving at the checkpoint. The software that used in this project are Microsoft Visual Basic 2008 Professional Edition and the database used Microsoft Access 2007.

3. To reduce the use of manpower at the each checkpoint.

Lastly, the third objective for this project is to reduce the use of manpower at the each checkpoint during the games. By implement this project in the big race competition, manpower used during the games can be reduced.

1.3 Problem Statement

Today's, in Malaysia a lot of manpower is used to make the big events competition games like LTDL games smoothly. This will involve high cost for each event every year. This smart detector device is a new way to solve this problem by developing the database using RFID. The challenge of this project is how far the data will transfer using RFID when the tags are placed on the bicycle passing the reader at the checkpoint. It is because RFID is a radio frequency protocol device and has a limited range. When there is any interruption while transmitting the data from the tag to the reader such as blockage or overlap, the data might be lost and the reader cannot receive the data as usual.

1.4 Scope of Project

A Smart Detector Database using RFID is a device that tracks the cyclist that passes on the checkpoint during the game. The RFID tags which carry the data will be placed on the bicycle and can be read by the RFID reader. The data will be transmitted to the RFID antenna by radio frequency signal. The read point is the RF range of an antenna. The reader will communicate with the tags and transfer the data to a host computer by using the LAN cable. At the PC monitor, the coding is written using Microsoft Visual Basic programming. The data stored in the tag will be saved in the database using Microsoft Access.

In order to monitor the cyclist during the games with using less manpower, this project has been formed and designed. This project consists of three parts which are tag, reader and display. For the RFID system, it consists of three parts which are an antenna, transceiver and transponder. The antenna uses radio frequency waves to transmit the signal that will activate the transponders or tags.

When, the transponder is activated, the tag transmits the data back to the antenna. For each RFID tags are consisting of unique ID that is means the RFID antenna can receive the information from a certain distance. The RFID system will integrate with the RFID Database Handling system and display the result that had been received from the external database handler.

1.5 Thesis Outline

This report is a document that delivers the ideas generated and the concepts are applied in this project. Chapter one contains the introduction of SDDR system. The introduction consists of project background, objectives, problems statement, scope and thesis outline.

While, in the chapter two is describe about the project literature review. In order to execute this project, literature review must be done to comprehend the whole system and to decide the best inputs, outputs and used devices. Data obtained from the journals, books and internet.

In the chapter three explain the methodology of the project flow and its functional block diagram. It also discusses the method used for the project, such as the system operation, hardware and software applied.

Chapter four consist of actual result and analysis of this project. It included all the main components together with the functionality and description applied in this project. After that, the discussion about the project was written in this chapter.

Lastly, chapter five is the project conclusion and recommendation. This chapter describe about the achievement for the whole project and gave the recommendation for the future development of this project.

CHAPTER II

LITERATURE REVIEW

In order to implement this project, the literature review must be done to understand the whole system and to decide what the best input, output and the devices that will be used. Literature review will help to gain more information about the RFID technology, also for hardware and software development.

1.6 History of RFID

The Radio Frequency Identification (RFID) is an auto identification technology that was developed in the 1940's [1]. RFID technology was a first developed in order to differentiate between a friends and foes aircraft during the Second World War. In the several years, RFID has come of age by the technology advances in microelectronics, wireless communications and also computer networks [2]. Today's, RFID become as one of the most rapidly growing segments of automatic identification data collection industry [3].

The other identification systems includes the barcode systems, optical character recognition system, smart cards and biometrics (including voice, fingerprinting and also retina scanning) is overcomes challenges for RFID system. This is because it does not require the line-of-sight communication, sustains harsh physical environments, maintain a cost and power efficient operations and allows for simultaneous tag identification [4].

The First RFID Patents goes to Mario W. Cardullo was claims to have received the first U.S. patent for an active RFID tag with rewritable memory on January 23, 1973. That same year, the California entrepreneur, Charles Walton, received a patent for a passive transponder used to unlock a door without a key. A card with an embedded transponder communicated a signal to a reader near the door. When the reader detected a valid identity number stored within the RFID tag, the reader will unlocked the door. Walton licensed the technology to Schlage Lock of San Francisco, the lock maker and other companies.

Later, companies developed a low-frequency (125 kHz) system, featuring smaller transponders. A transponder encapsulated in glass could be injected under the cows' skin. This system is still used in cows around the world today. Low frequency transponders were also put in cards and used to control the access to buildings [5].

Table 2.1: Historical timetable of technologies and efforts related to RFID development

Years	History
1800 – 1900	Faraday, Maxwell, Hertz early discoveries of electromagnetic energy and waves
1901	Marconi demonstrated the first UWB radio transmission over Atlantic ocean
1925	Birth of Radar
1939	First RFID concept for IFF systems in WWII
1947	Radar technology was first used to identify enemy and friendly aircraft. Technically this was the first used to RFID
1948	First technical idea behind RFID was published by Harry Stockman
1959	The IFF long range RFID system is fully functional and beings production
1963	Inventor RF Harrington formulates new RFID ideas which include