



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

WIRELESS MONITORING SYSTEM FOR RACING VEHICLE

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation and Robotics) with Honours

By

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DECLARATION

I hereby, declared this report entitled Wireless Monitoring System for Racing Vehicle is the results of my own research except as cited in references.

Signature :

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Automation and Robotics) (Hons.). The member of the supervisory is as follow:

.....

(Project Supervisor)

ABSTRACT

Nowadays, wireless vehicle monitoring has been the most widely used technology in racing event, automobile research and development, and racing sport analysis. Racing vehicle during race time is completely risky if there is no monitoring and well analysis for the condition of the vehicle. The racer during race time is not well alert with the vehicle condition and will increase the risk to the both racer and the vehicle itself. If there is something happen such as the vehicle temperature increases in sudden it will cause a problem and disturb the racing momentum. This project is focused on the monitoring some condition of racing vehicle during race or in racing time. In addition, the project is focused to monitor the speed, oil level along with heat from the car wirelessly. Such a system provides practical measures to resolve problems like jammed during race. Apart from which, it is important with the technical team to find out the whole condition of the vehicle through contest time pertaining to tactical along with the safety pertaining to racer along with the vehicle itself. A wireless monitoring system will be consists of wireless system, microcontroller part and the display. For wireless part XBee will be used as the main role to connect and act as the data exchanger and as a bridge between data collector (sensors) and microcontroller. Arduino will be used as the microcontroller that is the brain for the system. While the data programmed will be send to Android display through Bluetooth. Expectation of this project, the development of Wireless Monitoring System for Racing Vehicle is success as mention in the objectives. As the conclusion, this project expects to help to increase the tactical, strategy, safety and team management. A learning of their physical conditions may help to enhance execution and dodge some real harm. It is recommended that the project will be market and widely use in racing sport event.

ABSTRAK

Pada masa kini, pemantauan kenderaan tanpa wayar (wireless monitoring) telah menjadi teknologi yang paling banyak digunakan dalam acara perlumbaan, penyelidikan dan pembangunan, dan analisis sukan perlumbaan. Perlumbaan akan berisiko jika tiada pemantauan dan juga analisis yang baik untuk keadaan kenderaan ketika dalam perlumbaan. Pelumba ketika perlumbaan tidak betul-betul mengetahui dengan keadaan kenderaan dan akan meningkatkan risiko kepada pelumba dan kenderaan itu sendiri. Jika ada sesuatu yang berlaku seperti suhu kenderaan meningkat secara tiba-tiba, ia akan menyebabkan masalah dan mengganggu momentum perlumbaan. Projek ini memberi tumpuan kepada pemantauan beberapa keadaan kenderaan perlumbaan semasa perlumbaan atau dalam masa perlumbaan. Di samping itu, projek ini memberi tumpuan untuk memantau, tahap minyak, kelajuan dan juga suhu dari kereta secara 'wireless'. Sistem seperti ini menyediakan langkah-langkah praktikal untuk menyelesaikan masalah seperti gangguan semasa perlumbaan. Selain itu, ia adalah penting kepada pasukan teknikal untuk mengetahui seluruh keadaan kenderaan. Sistem pemantauan tanpa wayar akan terdiri daripada sistem tanpa wayar(wireless part), bahagian pengawal mikro(microcontroller) dan paparan(display). Untuk bahagian tanpa wayar, XBee akan digunakan sebagai peranan utama untuk menyambung dan bertindak sebagai penukar data dan sebagai jambatan antara pengumpul data (sensor) dan pengawal mikro. Arduino akan digunakan sebagai pemprosesan data iaitu otak untuk sistem. Data diprogramkan akan dihantar ke paparan Android melalui Bluetooth. Projek ini dijangka akan Berjaya untuk membangunkan sisteem pemantauan wayarles bagi kenderaan lumba seperti yang dinyatakan dalam objektif. Kesimpulannya, projek ini dijangka akan membantu meningkatkan taktikal, strategi, pengurusan keselamatan dan pasukan. A pembelajaran

keadaan fizikal mereka boleh membantu untuk meningkatkan pelaksanaan dan mengelak mudarat sebenar. Ia adalah disyorkan bahawa projek itu akan menjadi pasaran dan menggunakan secara meluas dalam sukan perlumbaan.

DEDICATION

Specially dedicated to my family. Especially for my parents.

Lots of love for both of you.

Peace Love Harmony

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Alhamdulillah. Allah Almighty and The Most Merciful.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

A wireless sensor system is an advanced framework which thinks that its utilization in applications like ocean and wildlife observing, military reconnaissance and so on. The same idea of extensive scale checking and observation through wireless sensor system (WSN) can be executed to guarantee improved security measures and inventive movement controlling procedures (Rajesh Kannan Megalingam et al, 2010). This section will clarify about the background of the wireless system, problem statement of the project, project objectives, and the scope of this project.

1.2 Background

Wireless vehicle monitoring is widely used in racing event, automobile research and development and many more. This project is about a type of platform to monitor some condition of racing vehicle during race or in working condition. The focus of this project is to monitor the speed, fuel level and temperature of the vehicle wirelessly. Such a system provides practical measures to resolve problems like jammed during race. Besides that, it is important for the racing team to know the condition of the vehicle during race time for tactical and the safety for rider and the vehicle itself. Racing

vehicles require multifaceted psychological and physical capacities in a multitasking circumstance. A learning of their physical conditions may help to enhance execution and dodge some real harm.

1.3 Problem statement

Implementation of wireless communication on racing vehicle is highly demand due to the increasing of innovation level in communication system. In the racing situation, the racer will not fully alert on the vehicle condition. The tactical and technical team will be fully responsible on the vehicle condition. The radio system that communicates between the racer and the team are not very efficient compare to the wireless monitoring system. It will disturb the focus of the racer to concentrate on racing situation. The team will monitor the vehicle conditions their self by using the wireless system rather than the racer inform it.

The application of a wireless sensor network (WSN) in road traffic monitoring systems can reduce accidents through wireless sensing and communication. Although there are some devices working as wireless communication systems, the operation of these systems is not in complete wireless mode.

1.4 Objectives of the project are to;

- i Study the electrical parameters of sensor for speed, fuel level, and temperature
- ii Simulate the design of the wireless monitoring system on simulation software
- iii Develop a monitoring system for some condition on racing vehicle

1.5 Work scope

In this project there are consists of 3 main part. That is wireless system, microcontroller and sensors.

1.5.1 XBee Explorer

XBee Explorer will be used as the medium of wireless communication system. XBee will receive data from sensors and transmit to microcontroller (Arduino). Base on it specification, price and efficiency, XBee Explorer are trusted to perform a medium between sensors and microcontroller. Medium data rate (250kbit/s) and low power consumption. Used to make mesh-type sensor networks; each XBee device can communication with each other and through each other via the mesh to devices that are out of range. Used for networks of devices, particular home automation and sensors.

1.5.2 Arduino Uno

The Arduino Uno utilized open-source Arduino Uno integrated development environment (IDE) for aggregating and transferring projects to the board. The Arduino Uno projects can be composed utilizing C or C++ language. These two languages were categorized as an intermediate-level language. The Arduino Uno is used to monitor and control the signal output from the sensors.

1.5.3 Sensors

To complete the collecting data process, the sensors are really needed. Arduino requires data from all the sensors to the control system programmed. There are various

types of sensor on the market. Analog sensor selected to sense the input data. This for several reasons, one of them as analog input easier to read by Arduino.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction of Literature Review

In this section, it will eventually go over mostly on the concept as well as the progress throughout Wireless Monitoring System in addition to Sensors Application. The ideas in addition to facts that use to develop that project have been discussed about in this section.

2.2 Microcontroller

In this project, method been use to control the system is by programming. There is a lot of programmable system. To choose the best and most suitable programmable system, some features need to compare.

Anif Jamaluddin et al, (2013), stated in journal titled Design Real Time Battery Monitoring System Using LabView interface for Arduino (LIFA), This monitoring system basically use arduino as the software to develop a program to control the monitoring data sense from each sensors that received from transmitter that located at the vehicle itself. The chosen of arduino is based on its efficiency. A racing vehicle monitoring system using arduino is more robust instead of using microC due to its straightforward and accommodating, given that it is just a visual tactic not any have to

have involving publishing applications involving 100 lines similar to some other program languages (Anif Jamaluddin et al, 2013).

2.2.1 PLC

The programmable logic controller, PLC, or even programmable controller is usually an innovative PC utilized for automation connected with commonly professional electromechanical processes, by way of example, control connected with computer hardware in plant sequential construction systems, amusement voyages, or even light-weight apparatuses. PLCs can be used as a part of a lot of equipment, in a number of businesses. PLCs are generally meant for different programs connected with innovative along with easy inputs along with produces, increased temperature ranges, invulnerability to help electric turmoil, along with imperviousness to help vibration along with influence.

Assignments to manage appliance function are normally remove inside battery-backed-up or even non-unpredictable recollection. The PLC is an event of a "hard" steady framework because yield final results has to be provided inside light-weight connected with facts conditions inside of any confined moment, typically unintentional function will happen about. The PLC gives several advantages and disadvantages (Dong Yulin et al, 2011). Some of the PLC set that are in market is MITSUBISHI PLC Panel as shown in Figure 2.1.

Disadvantages of PLC are;

- i. Worse compatibility cooperate with the new equipment
- ii. poor fulfillment of the high computation and powerless correspondence
- iii. Demand skilled employees.
- iv. Every time an issue occurs, hold-up time period is actually long, usually prolonged.

Advantages of PLC are;

- i. Attributes are ease, less line and simple operation.
- ii. Can speak with design programming through this interface and screen the working state of information and gear.
- iii. PLCs are easily programmed and also have absolutely a good simply understood programming language.



Figure 2.1: MITSHUBISHI PLC Panel

2.2.2 PIC

PIC is an area particular programming language for determining graphs regarding questions, for example, boxes with bolts between them. The pic compiler makes an interpretation of this portrayal into solid drawing charges. Pic is a procedural programming language, with variable task, macros, conditionals, and circling. The dialect is a case of a little dialect initially proposed for the solace of non-software engineers. An example of PIC18F2550 is shown in Figure 2.2

PIC was initially actualized, is still most regularly utilized, as a preprocessor in the report handling framework. The pic preprocessor channels a record, supplanting outline portrayals by solid drawing orders and passing whatever is left of the archive through without change. PIC also can speak with design programming through this

interface and screen the working state of information and gear. Based on study, PIC has its advantages and disadvantages (Li Bei-ming et al, 2011).

Disadvantages of PIC are;

- i. Program memory is not accessible and only one single accumulator is present.
- ii. Along this system will be large as a consequence of applying Reduced Instruction Set Computing (RISC) that is consisting of 35 instructions.

Advantages of PIC are;

- i. Can accomplish best framework execution without expanding receiver complexity.
- ii. Can connect analog devices directly without any extra circuitry and use them.
- iii. Programming is also very easy when compared to other microcontrollers.



Figure 2.2: PIC18F2550

2.2.3 Arduino

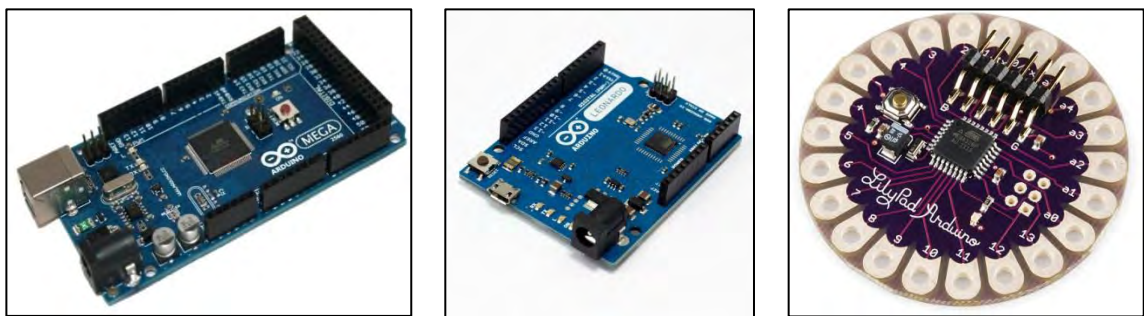
Arduino is definitely open-source actual physical computing software based on a fairly easy I/O mother board plus an improvement environment of which uses the

Processing/Wiring language. Arduino can often produce stand-alone interactive materials or even can be associated with computer software on your hard drive.

Based on a study that has been done in Development of Fire Alarm System using Raspberry Pi and Arduino Uno, ARDUINO is less expensive instruments, web based and remote broadband innovations have moreover enhanced and there are a currently different framework that empowers shabby, high rate information transmission and remote systems administration. The force supply for the Arduino Uno can be either from a USB association, DC power supply, or both. It is an elite gadget which has low power A VR S-bit Microcontroller with 32K bytes in-framework and progressed decreased guideline set registration (Md Saifudaullah Bin Bahrudin et al, 2013).

Other types and sizes of Arduino Compatibles as shown in Figure 2.3

- i. Arduino MEGA has many more pins, much more memory for programs and data.
- ii. Arduino Leonardo uses a single ATMEL chip for both programs and USB connection. It is cheaper.
- iii. Lilypad Arduino is a small round, flexible board intended to be sewn into clothing.



(a)

(b)

(c)

Figure 2.3: (a) Arduino Mega 2560, (b) Arduino Leonardo, (c) Lilypad arduino

2.3 Wireless System

In the choosing of what the most suitable wireless system that needed to use in this project, several wireless system were listed. Criteria that been observed are range of the device, power consumption, cost, size of the device and other added factors. Therefore, I have come out with full listed wireless system that can be used to receive data from sensors and transmit the data to Arduino wirelessly.

To overcome the restrictions of wired sensor networks, a study about Cost-Effective and Feasible Handoff Application for Mobile Phones has been done and it stated that wireless technology increase the accessibility of Internet administrations. Be that as it may, most recent cellular telephones with at any rate two interfaces just get to these administrations either by means of WiFi or UMTS/HSPA. From client's view, an ideal utilization of heterogeneous systems with today's cellular telephones incorporates consistent information transmission utilizing vertical handoff (VHO) arrangements. Brought about by high specialized and financial expenses there exist no usable answers for readily seamless data transfers (Maiké Kuhnert et al, 2013). Some of example for wifi that have in the market is shown in Figure 2.4

2.3.1 Wi-Fi

Wi-Fi has a high data rate (54Mbit/s +) but also high power consumption. Wi-Fi usually used when some device need to connect directly to the internet, such as an internet-of-things device, and have an external power source. Figure 2.4 shows a Wi-Fi router commonly used. Wi-Fi has several advantages and disadvantages (Z. Gal et al, 2013) and (Xudong Wang et al, 2015).