WIRELESS DATA LOGGER

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Special thanks to my family, project supervisor and friends

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ABSTRAK

Sistem wayarles "data logger" merupakan satu sistem pengumpulan data yang digunakansecara meluas dalam pelbagai bidang untuk mengumpul data seperti signal kuasa, suhu dan sebagainya. Secara amnya, sistem in diaplikasikan untuk mengumpul dan menyimpan data yang dikehendaki untuk memerhatikan variasi perubahan sesuatu data yang dianalisa. Menghadap zaman digital masa kini, sistem wayarles "data logger" mungkin berharga mahal di mana pengguna tidak mampu memiliki satu dan sangat rumit cara penggunaannya .Dalam projek ini, objektifnya adalah untuk membina suatu sistem wayarles "data logger" dengan komponen elektronik yang kurang bilanganya lalu mengurankan harga sistem ini. Selain itu, adalah suatu yang penting dimana sistem ini dapat menghantar maklumat dalam bentuk wayarles. Dengan projek ini juga , suatu perisian akan dibina untuk menerima data tersebut dan menyediakan tempat penyimpanan data dalam computer. Seterusnya jangkaan hasil projek ini adalah satu sistem wayarles "data logger" yang berkualiti lagi berkesan bagi mengumpul maklumat untuk dianalisa pada masa depan. Projek ini juga dapat dikomersialkan dalam pelbagai industry seperti pertanian , gudang dan lain lain lagi.

ABSTRACT

A wireless data logger system is widely used in various fields to log data of variable parameters such as power signal, temperature and many more. It is generally used to store and accumulate data received from a particular data source. The importance of wireless data logger is as a recording device for creating a time-sequence history of events for a subjected parameter. The primary focus of this project would be on the acquisition and logging of data signal. Nowadays, any data loggers either wired or wireless are costly and also complicated to use it. The key objectives to develop this wireless data logger are to implement fewer components thus reducing the cost of it, as well as making it portable via wireless transmission .The wireless data logger is developed with software which enables user to monitor data acquisition of particular parameters and save it according to the date the data acquired. The expected result of the project would be a reliable and fully functional user-friendly signal data logging system with the ability to log data signal input for future references. The wireless data logger can be commercialized to be used in agriculture industry, fermentation and warehouses.

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LIST OF ABBREVIATIONS

SD	-	Secure Digital
PIC	-	Peripheral Interface Controller
CPU	-	Central Processing Unit
DIP	-	Dual Inline Package
IC	-	Integrated Chip
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
PWM	-	Pulse Width Modulation
USART	-	Universal Asynchronous Receiver/Transmitter
MSSP	-	Master Synchronous Serial Port
I/O	-	Input/output
SPI	-	System Packet Interface
CLK	-	Clock
SCLK/SCK	-	Serial Clock
CMD	-	Command
CS	-	Chip Select
MOSI	-	Master Out Slave In
MISO	-	Master In Slave Out
ANSI	-	American National Standards Institute
IDE	-	Integrated Drive Electronics
ADC	-	Analog-to-Digital Converter

CHAPTER I

INTRODUCTION

1.1   Project Introduction

Wireless Data Logger is a device which enables collection of particular data from distinguished sensor to be sent to a personal computer or a laptop via wireless transmission medium. In this project this device incorporates the use of Bluetooth with the range of 30m indoor and 100m line of sight outdoor to send the information from time to time to a data logging framework software. Moreover the device as well will be included with Liquid Crystal Display (LCD) panel to provide real time monitoring of temperature and humidity on the device as well. The information collected as well will be compiled into a spreadsheet with the help of the data logging framework software. Typically data logger is battery powered and includes a sensor, microprocessor, wireless medium and computer interface.

1.2 Project Objectives

The main objectives of this project are to design and construct a wireless data logger which is relatively cheap in cost which is estimated to be around RM250 below with minimizing components to achieve its economical value. Moreover it is also to use Bluetooth as a module in providing wireless transmission medium to transmit information to a Bluetooth enabled personal computer. It is also to use Microsoft Visual Basic software to design a data logging framework which will collect data wirelessly and convert the data into spreadsheet to be analyzed later on.

1.3 Project Problem Statement

As mention above in the introduction, this system uses wireless communication system as transmission medium as previous data loggers do require wired transmission medium to communicate. Nevertheless the development is not limited until that, whereas extra features can be installed in this project that will provide a convenience to the user.

By implementing Bluetooth technology allows remotely to access and use Bluetooth enabled devices without the use of wires. In this case the device can be moved around easily without the need of altering wires plus with a limited range. However the Class 2 Bluetooth will be used as it can provide the range of 30m from the interfacing personal computer or laptop.

Compare to the previous project, the wireless data logger was not included with real time monitoring. Real time monitoring via LCD as well provide the user with ease of application. Real time monitoring as well will enable user to determine whether the device is functioning with perfect as well the information being monitored on the spot to enable any configurations to be done on the environment by the user.

This device as well will be featured with temperature and humidity reading with the help of distinguished sensor. Plus this information will be transferred to a

personal computer or a laptop with the help of data logging framework thus converting the information to a spreadsheet for further analysis by user .This project is being developed with low cost and for simple installation as most already available data logger in the market are expensive as well as complicated to be used.

1.4 Project Work Scope

The scope of this project basically divided into two parts which is hardware and software. For the hardware section, the designing of the wireless data logger prototype consists of only one type of sensor component which can sense changes in temperature and humidity , programmable microcontroller (PIC) and Bluetooth module which need to be configured first before it can transmit information wirelessly to Bluetooth enabled personal computer or a laptop. The PIC which is being used is a 16F887 PIC where it is programmed to interface with software. Thus the designing of it continues with fabrication of the printed circuit board (PCB).

On the other hand, for the software part it includes the development of data logging framework as control panel to receive information via Bluetooth. The software for the data logging framework will be developed using Microsoft Visual Basic. Thus as in software the programming of the PIC as well will be done by using MPLab. Personal computer with enabled Bluetooth will then be interfaced with the Wireless Data Logger device.

1.5   Overview

Completely, this report consists of 5 main chapters and there are Introduction, Literature Review, Methodology, Result & Analysis and Conclusion & Recommendation. In Chapter 1, the introduction is briefly explained the overview of the whole project and why it must be implemented in real life. It is highlighting on the background, project objectives, problem statement, methodology and scope of work on the operation of wireless data logger. In order to achieve the objective the methods that have been used in the project are explained in detail in Chapter III. This chapter also briefly explains the development of the project. It includes the integration of hardware and software that have been used in this project. Chapter IV is a Result & Analysis that explained analysis of the circuits. Conclusion & Recommendation are included in Chapter V whereas it is briefly described the conclusion of the project and suggestion on how to further improve this project for the future developer.

CHAPTER II

LITERATURE REVIEW

2.1   Introduction

This chapter will discuss about the projects backgrounds. Its also includes some specifications about the market ready product which is related to this project.

2.2   Literature Overview

As explained before there are many kind of products that have functions to record the measurements features in recording the measurements temperature and humidity in physical properties. However a data logger which is already in the market does not come with the features of wireless transmission or real time monitoring or both altogether. These data loggers are considered design with its own limitations plus it is also expensive. Plus the products as well come in only measurement taking sensors which is limited to either only temperature or humidity reading. The conventional method is that somehow still popular as before but it is not efficient and provides inaccurate readings.

Based on research online regarding market ready data loggers, the examples of data logger products are from Madge Technology, Dickson Data Products and TMI Orion Tech. From each of the manufacturers stated before has been chosen one

particular product which provides wireless data logging devices to be compared with each other. Each products will be compared if whether wireless transmission, temperature and humidity sensing, real time monitoring is included and cheaper than RM250 or not.

2.3   Madge Technology RFRHTEMP2000A Wireless Data Logger

Figure 2.3: Madge Technology Wireless Data Logger [9]

As refer to Figure 2.3 RFRHTemp2000A is a wireless data logger which provides the benefit of sensing temperature and humidity with on board display. It is ideal to be used in industrial sector or laboratory such as like supply chain storage facilities, incubator monitoring and HVAC studies. It is designed based on RTD based temperature sensors and external humidity sensor. Moreover the design provides a fast time response for both parameters. Using the wireless module of RFC1000 transceiver, to provide customer convenience such in starting, stopping and downloading is easy wirelessly. This allows customers to quickly access data and spend less time maintaining the device. Data can be provided in real time back to a central PC, or the device may be downloaded at periodic intervals. This device selling price is at astonishing RM1046.50.[9]

2.4 Dickson Data Products TP125

Figure 2.4: Dickson Data TP125 [8]

Little and basic like the picture indicated in the Figure 2.4, Dickson information data loggers can measure temperature and dampness which outperforms in the broadest range of requisitions, administrative agreeability, HVAC adjusting, warehouse mapping , process control and more. It is modest to situate up, simple to utilize and electric cell fueled. Dickson's SP/TP arrangement of USB information data logger set another standard in faultless, simple to utilize, reasonable PC based recording. Because of their smaller size, rough outline and electric storage device control they could be set simply about at whatever place. Screen temperature or temperature and moistness with models that come furnished with either an inner sensor for perusing air temperatures or both an inward and outside sensor for perusing temperatures in great situations or difficult to arrive at spots. This gadget offering cost is at RM 486.[8]

2.5   TMI Orion Tech Pico VACQ Temperature and Humidity

Figure 2.5: Pico Tech VACQ Temperatures and Humidity [10]

As referred to Figure 2.5, PicoVACQ surely is the most progressed group of items from Tmi-Orion. The most cutting edge electronic innovations are utilized, while exhibitions are supported and extents decreased to the most modest data logger conceivable. Uncommonly intended for clean commercial enterprises, all the models of this family empower quality control and transform acceptance of sustenance or drug store businesses. Information transmission with the utilization of USB link interfaced with particular machine. This gadget advertising cost is at RM 512.[10]

2.6   Comparison between the Market Ready Data Loggers

Table 2.6: Product Comparison

Products	Wireless Transmission	Temperature Sensing	Humidity Sensing	Real Time Monitoring (LCD)	Cost < RM250
RFRHTEMP2000A	✓	✓	✓	✓	✗
TP 125	✗	✓	✓	✗	✗
Pico VACQ	✗	✓	✓	✗	✗

As we can refer to the product comparison table 2.6, can be concluded that the cost is more than RM250 which is considered expensive. Moreover two of the products are not included with wireless transmission to transfer logging data but need to be wired in order to interface it with personal computer. It can be seen also that more features a product is developed with more higher the price of the device.