UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Wi – Fi BASED SENSOR NETWORK FOR AN AGRICULTURAL ENVIRONMENT

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Electronic Telecommunication)(Hons.)

by

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TAJUK: **Wi-Fi Based Sensor Network for an Agricultural Environment**

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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 (Electronic Telecommunication) (Hons.). The member of the supervisory is as follow:

MRS NORLEZAH BINTI HASHIM

(Project Supervisor)

ABSTRAK

Tujuan projek ini adalah untuk membina system asas hubungan pengesan "Wi-Fi" untuk mengawal persekitaran pertanian. "Wi-Fi" dan juga telefon android telah dikerahkan di dalam system sas hubungan pengesan "Wi-Fi". Sistem ini memerlukan penggunaan "Wi-Fi" sebagai perantara untuk menghantar data melalui udara dan tanpa wayar. Operasi ini termasuk aplikasi oleh telefon Android kerana ia merupakan peranti yang mempamerkan tahap suhu. Data yang diperoleh dari persekitaran pertanian akan dipindahkan melalui "Wi-Fi" dan diakseskan oleh telefon Android. Pengawalan peranti bagi project ini adala pengawal mikro. Eksperimen telah dijalankan untuk mengenalpasti kesan jarak "Wi-Fi" terhadap masa untuk menerima data. Projek ini juga telah Berjaya dihasilkan, dilaksanakan dan juga dianalisis.

ABSTRACT

The purpose of the project is to develop the system of Wi-Fi based sensor network for an agricultural environment. This empowered system is designed in order to sense the live temperature at the farm field and the data record displays on Android Smartphone. The wireless fidelity (Wi-Fi) and a Android Phone are deployed in the Wi-Fi based sensor network. The system required the usage of Wi-Fi as a medium to transmit the data through the air and wirelessly. The operation includes the application in the Android Phone as it is a device that displayed the status of the live temperature. The temperature data collected from the environment of agricultural will transmit via the Wi-Fi and accessed by the Android Phone. The controlling device in this project is the microcontroller. The experiment was conducted to observe the effect of the Wi-Fi range to the delay in receiving the data. This project has successfully designed, implemented and analyzed.

DEDICATION

To my beloved mother and father who are always
encourage me
Normah Binti Mokhtar & Kamaruzaman Bin Ali
To my siblings
Muhamad Sofi Bin Kamaruzaman
Muhamad Nur Atif Bin Kamaruzaman
Hanis Baiduri Binti Kamaruzaman
Izzat Suria Bin Kamaruzaman
To my lecturer and supervisor for their supports
Mrs Nerlezah Hashim
To all my friends

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In particular, thanks to my supervisor Pn Norlezah Binti Hashim for her guidance complete this project. An suggestion from her is useful to be applied in order to overcome the problem during analyzing the project. NurulFarah Afiqah Binti Mohammad Azmi, Mohamad Rossaifudin Bin Mohamad@Muda, Siti Nor Shahida Bt Md. Desa and Farah Lyana Bt Mohammad Zaki. They have contributed towards my understanding and thoughts.

Last but not least, I would to express my sincerest gratitude and deepest thankfulness to my parent Kamaruzaman Bin Ali and Normah Bt Mokhtar for their unconditional love, support and encouragement.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

AD	-	Analog Digital
ASCII	-	American Standard Code for Information Interchage
AC	-	Alternating Current
ADC	-	Analog Digital Converter
BJT	-	Bipolar Transistor
CO2	-	Carbon Dioxide
CVS	-	Concurrent Version System
DC	-	Direct Current
FRS	-	Facility Registry System
GSM	-	Global System for Mobile
GND	-	Ground
IP	-	Internet Protocol
IC	-	Integrated Circuit
I / O	-	Input and Output
LCD	-	Liquid Crystal Display
MOSFET	-	Metal Oxide Semiconductor Field Effect
MP3	-	MPEG-1 Audio Layer-2
PIC	-	Peripheral Interface Controller
PWR	-	Power
PH	-	Potential of Hydrogen
PC	-	Personal Computer
RX	-	Receiver
SMS	-	Short Message Service
TX	-	Transmitter
UART	-	Universal Asynchronous Receiver Transmitter
WIFI	-	Wireless Fidelity
WBSN	-	Wi-Fi Based Sensor Network

CHAPTER 1
INTRODUCTION

1.1 Background

Wireless Fidelity Based Sensor Network, (WBSN) is a device which designed based on smart wireless sensor network for monitoring an agricultural environment. The design is mainly focuses on the uses of Wi-Fi in android phone as a medium and the live temperature status at the agriculture site is displayed on the screen of android phone. This automation device implements a systematic way to improve the manual system in monitoring the temperature in agriculture field. In plantation, the live temperature is very important as it is one of variables that must be constantly monitored to ensure optimal conditions. In manual system, a lot of problems can be faced not only for a farmer but also affected the rate of production yields. A Wi-Fi is a medium for the worker to gather the data from one point to trace down the local climate parameters in different area.

In the past few years, automatic irrigation system has seen a rapid growth through the innovation of technology. The features about this automation system are low cost and more efficient in contributing the energy as less power consumption needed. Previously, this monitoring device is controlled through the SMS by using a Global System for Mobile (GSM) and Bluetooth module. For Bluetooth module, it eliminates the usage of charges between the user and the central site. Unfortunately, the connection for appliances via Bluetooth is in a limited range of few meters only. The system informs the user about the temperature rise and moisture content at the site through the SMS application. Although the Bluetooth also minimize the cost of usage network, the range operation is limited for a few meters.

For the Wi-Fi based sensor network project, WBSN innovate the previous technologies by improvising the system. The usage of Wi-Fi enables a wide range area for a system to be operated. Through Wi-Fi, the user can access the temperature reading by using android phone at further site. More plantation area can be monitored through the usage of Wi-Fi medium. A Wi-Fi (short for Wireless Fidelity) is a wireless technology that uses radio frequency to transmit the data through the air.

1.2 Problem Statement

An agriculture plays a vital role in almost country as agriculture is the basis for the population through the production of food or land and other important raw materials. In the proposed system for agricultural environment monitoring, the Wi-Fi medium has been implemented. The yield of crops, fruits have not been increasing if the farmer still depending on the traditional way of farming. Manually, it is hard for the labor to obtain the specific temperature that suitable for the crops. Thus cause more error to optimize the data. The usage of Wi-Fi consists of spatially distributed autonomous sensors. It enables the device to sense any environmental conditions such as temperature, moisture and pressure. But, for this project it is mainly concern on temperature only. In WBSN, it offers the flexibility and mobility to save cost and energy.

Although Wi-Fi contribute in wider network coverage compared to Bluetooth, but it only operates in specific range. More site of plantation needs to be sensed by using the sensor through the Wi-Fi system. To solve the problem among the worker in agricultural site, the status of the latest temperature can be detected automatically as it is displayed on the screen of the android phone. Depending on the temperature of the environmental, a temperature sensor senses changes and provide the informer the details via the Wi-Fi signal.

1.3   Objectives

The objectives of this project are to :

a)   design a Wi-Fi Based Sensor Network for an Agricultural Environment that can monitor the live temperature of agricultural environment.

b)   implement a system that can be access by the Android user through Wi-Fi medium.

c)   analyze the system performance in term of reception detection and delay.

1.4 Scope

This research is focuses on the monitoring the live temperature in agricultural environment. The system is a development of a irrigation automated system that using a wireless technology. A smart sensor based monitoring system for agriculture has been used to maximize efficiency to obtain the data temperature. The Wi-Fi becomes the main signal to transmit the data from the device to Android Smartphone.

A rapid growth of technologies enables the farmer to enhance their skills in maintaining the quality and the quantity of yields in plantation. This device is a newest technology that monitoring the environmental temperature over the Wi-Fi. As the mobile phones becomes pervasive to a farmer, the telecommunication system is improvised by applying it in agricultural field.

Based on this, it creates a chance for worker to do their task efficiently as the user get familiar to access into this automation device. The usage of Wi-Fi based sensor network makes the user friendly interfacing with it. Review the Android Smartphone as the output, the system is useful for transmitting the data from one site to another as long as in the Wi-Fi range.

1.5   Project Significance

Agricultural environments are complex where the significant changes due to environmental factor that could give an impact to the temperature reading. As the consequences, the farmer needs to indicate a system that enables the user to predict the upcoming changes in the environment site. The particular interest of this WBSN is only focus to sense the temperature. This will provide awareness to the farmer to control the plantation management system.

Any manual collection of data requires a plenty of time to analyze the consistency. In addition, the manual system is not permanent and some time is incorrect. This causes a difficulty for a farmer to control the live temperature. In a varieties application, the sensor network has been deployed. This will lead to awareness to the user with regard to implement the uses of technology into an agricultural environment. A sensor network is becoming the solution to solve any existing problem in industrial and agricultural sector due to the ability of sensor which is automatically operated.

A particular reason the wireless system used in agricultural environment as the agricultural monitoring system required a large amount of wires and cables to distribute the nodes. Sometimes, the sensor location often to reposition and this one of the evidence that the Wi-Fi provides additional flexibility and could cost a substantial deal of time and also energy.

1.6   Conclusion

It is necessary for the farmer to use this device to monitor the environment temperature in plantation area. Through this system, the user get easily interface with this newer product as it is flexible and reliable to access. The Wi-Fi module that use as a medium in this project control the temperature surround and ensure that the optimal condition can be reach during the plant growth. An automation sensor provides a consistent and accurate result to the user depending on the temperature sense in agricultural site. The system has successfully overcome a quite few shortcomings of the existing systems by reducing the power consumption. Any maintenance can be minimized as this device is wirelessly and less complex.

CHAPTER 2
LITERATURE REVIEW

2.1   Introduction

In process of project development, the literature review conducted to understand the theory, methods and technologies associated with systems that have been developed in existing technologies. Background research on the organization and comparative studies of existing system is also done to understand the system requirements before the system is develop. Explanation will be focused on WBSN in the agricultural environment.

Nowadays, the usage of an automation device becomes important in industrial and agriculture sector. Instead of having the technology device in life, it still limit the user to receive information automatically. This project upgrades the application of the system by using a Wi-Fi and Android Smartphone. The focus of WBSN is in agricultural environment which act as a monitoring system to the farmer. As in the existing technology limits the usage for monitoring and controlling the climate parameter in agricultural site, this difficulty can be overcome by implementing the WBSN.

The manual collection of temperature data is one of the desired factor affect the production of crops in plantation. The temperature becomes the major parameter to the agricultural environment to advance the system. The temperature sensor has to be used by the farmer via the Wi-Fi medium. The WBSN can help in reducing the time and energy required to monitor the environment. Logging of data allows the placement in being lost or even misplaced.

2.2   WBSN for Agricultural Environment

The project aims monitoring an agricultural environment by designing the Wi-Fi based sensor network. The device operates in ON / OFF conditions by using the Wi-Fi in the Android Smartphone. The climate parameter which is the temperature status can be displayed on the screen of the Android Smartphone. In this project, the major concern is to sense the temperature. An automation device brought a revolution in the industry especially in agriculture sector.

People prefer to solve the problem in a simple and effective way. One of an alternative that can be applied is by designing a WBSN project that helps in lowering the consumption of the power. The WBSN is suggested to help in solving the problem among the user in agriculture sector. This project relates the usage of Wi-Fi in the Android Smartphone to become a controller for switching of the device.

The project includes the application to receive data from the system. It designed to ease the user to monitor the suitable temperature for plants by accessing the application. The application of Wi-Fi module is used as it is one of the wireless technologies that require the uses of radio frequency to transmit the data. The sensor acts as the detector to the environment. Any stimulation from the environment will be detected by the sensor that has been applied to this system.

2.3   Existing Technologies in Wireless Sensor Network

2.3.1 Greenhouse Management Using Embedded System and ZigBee Technology (S.Thenmozhi, 2014)

In agricultural enviroment technology, a lot technologies required the usage of a wireless sensor network. Introduced by S.Thenmozhi in Greenhouse Management Using Embedded System and ZigBee Technology, the monitoring and controlling system of the climate parameters in a greenhouse environment has been researched. The system is become significant in greenhouse production and management. The process to control the climate temperature, humidity, moisture and PH value of the soil can be effectively monitor by using both manual an automatic manner. In manual system, the Zigbee wireless sensor network is used. Any collecting data in agricultural environment can be controlled through the PC and the data will transmitted to the controller back. The main objective is to design a simple, easy installation, microcontroller-based circuit to monitor and record the values of the temperature, humidity and sunlight of the natural environment. Varieties of sensor modules are used in the ZigBee system in order to handle the light, drainage process in a greenhouse.
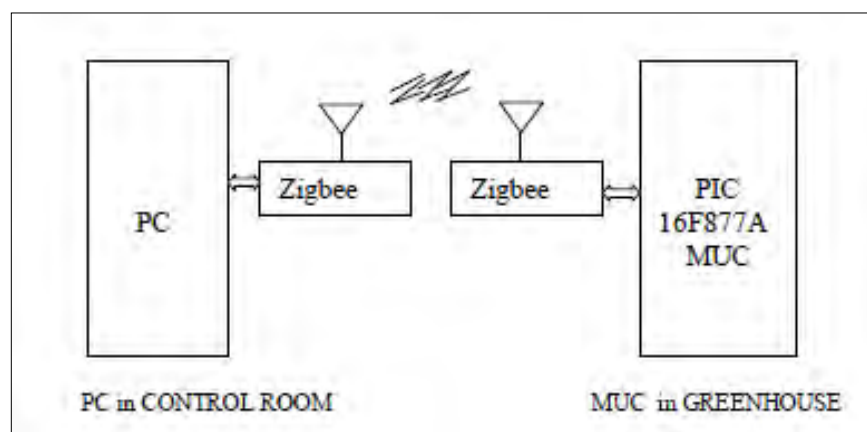
Figure 2.1 : Basic system model of manual controlling purpose