DEMODULATION AND MODULATION OF HIGH BIT DATA TRANSMISSION IN LOW VOLTAGE SUPPLY SYSTEM

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To my beloved mother and father

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ABSTRACT

Nowadays, we can found many technologies that have been developed for control applications. Power line communication (PLC) is one of the technologies that has been proved useful for control applications. It is widely use in home automation, automotive, and internet access applications. Up to date, there is no product found in the market use it for agricultural applications. Its potential for agricultural application is very promising. This study focuses on the development of a prototype using PLC system for control application in agricultural sector. On the sane token, X-10 is a well known technology used in home automation. This prototype uses the same technique in X-10 technology, but with a few improvement and modification to suit the control application in the agricultural sector. Graphical user interface (GUI) using Microsoft Visual Basic 6.0 software has been developed and functions as a switch to control electrical devices used in agricultural application remotely. Power line modem and controller for this system has been successfully fabricated at cheaper cost as compared to other systems sold in market. Today, farmers can have full control of their electrical machines by only pressing a single button on the graphical user interface.

ABSTRAK

Kini terdapat banyak teknologi telah dibangunkan dalam aplikasi kawalan. Komunikasi melalui talian kuasa adalah salah satu teknologi yang boleh digunakan untuk aplikasi kawalan. Teknologi ini telah banyak digunakan di dalam aplikasi automasi rumah, automotif, dan capaian internet. Penggunaan teknologi ini dalam sektor pertanian masih belum diaplikasikan dan terdapat potensi yang besar utuk diaplikasikan dalam sector ini. Kajian ini bertujuan membina prototaip bagi bagi satu sistem yang menggunakan teknologi komunikasi melaui talian kuasa untuk aplikasi pertanian. Teknologi X-10 banyak digunakan untuk tujuan automasi rumah. Prototaip ini menggunakan teknologi X-10 yang telah dikembangkan untuk tujuan aplikasi pertanian. Perantara muka menggunakan perisian Microsoft Visual Basic 6 dibangunkan berfungsi sebagai suis untuk pengguna mengawal mesin atau peralatan elektrik dari jauh. Fabrikasi modem dan pengawal untuk sistem ini berjaya dibangunkan dengan menggunakan kos yang jauh lebih rendah berbanding sistem-sistem yang dijual di pasaran. Sekarang, petani boleh mempunyai kawalan penuh ke atas mesin dan peralatan elektrik yang digunakan untuk pertanian. Hanya dengan menekan satu butang di paparan skrin computer, mesin boleh dikawal mengikut kehendak mereka.

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LIST OF SYMBOLS

Zt	-	output impedence
Zl	-	input impedence
Ω	-	ohm
Ø	-	angle
t	-	time

LIST OF ABBREVIATIONS

AC	-	alternating current
AM	-	amplitude modulation
BPL	-	broadband over power line
CENELEC	-	European Committee for Electrotechnical Standardization
DC	-	direct current
DSL	-	Digital Subscriber Line
FCC	-	Federal Communications Commission
FSK	-	Frequency Shift Keying
GUI	-	Graphical User Interface
IC	-	Integrated Circuit
I/O	-	Input/Output
MAC	-	Media Access Control
PAN	-	power area networking
PLC	-	power line communications
PLN	-	power line networking
PLT	-	power line technology
TPC	-	turbo product coding
TTL	-	transistor-transistor logic
UK	-	United Kingdom
US	-	United States
ROM	-	Random Access Memory
SMT	-	Surface Mounted Technology

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CHAPTER 1

PROBLEM STATEMENT

1.1 Introduction

Nowadays, people would like to optimize the use of electrical devices that become part of their daily life. Even in agricultural sectors, farmers tend to use modern technologies in order to maximize production and minimize operation cost. Most of them like to have a system that can help them to control and monitor their remote area farming machines. Te popular technologies currently being used for this kind of control application are wireless system, fibre optic and telephone cable. However each type has its own limitation in term cost and durability when installed in different environment condition.

The advantage of using electric power line as the data transmission medium is because every electrical device that needs to be control is already connected to the power line and subsequently connected to power grid. The (PLC) system uses the

existing alternating current (AC) electrical wiring as the network medium high speed network access almost every where there is an AC outlet.

1.2 Objectives

The main objective of his project is to design and fabricate a system-cum-prototype that is suitable for agricultural applications by using amplitude shift keying (ASK) data transmission. Target electrical machines that used for this application can be control remotely using personal computer.

1.3 Scope of Project

There are few aspects need to be covered when undertaking this project. All processes connected to this project are listed below:

1. The system-cum-product shall comply with the European Standard EN50065 which limits the communication frequencies using power line between 3 kHz to 148.5 kHz.
2. Graphical user interface (GUI) shall be designed using Visual Basic 6 software to control the system.
3. Establishment of connection between computer (GUI) and microcontroller via serial communication using in-house design protocol.
4. To establish connection between a power line modem to another power line modem.
5. Controlling devices using microcontroller.

1.4 Thesis Outline

The remaining six chapters are concern with different aspects involving the processes of designing and fabricating the system-cum-product.

Chapter 2 Literature Review

This chapter describes the basic idea of PLC. By studying the power line technology (PLT) such as LonWorks, CEBus, Homeplug, and X-10 technology, designing a new system by using one of these technologies is easier. This chapter also discusses on the signal modulation technique and PLC applications. One of the modulation techniques discussed here shall be used for developing the power line communications system.

Chapter 3 System Overview

In this chapter parts and modules used in the system development is discussed in details. By understanding the power line works in the system, design process will be easier. Controller module and parts used in this module will be explained briefly in this chapter.

Chapter 4 Methodology

Chapter 4 presents the most important parts of this thesis. Explanations on implementation system operation are discussed in this chapter. The detail descriptions of software and hardware implementation approach to accomplish this project are also described here.

Chapter 5 Result

The designed network protocol and the whole system are discussed in this chapter. Graphical user interface (GUI) designed using Microsoft Visual Basic is also explained briefly here.

Chapter 6 Discussion

This chapter provides the information on the cost to develop the system. The cost to develop this system is cheaper compare to other system sold in market. The advantage of this project compared to X-10 technology also being discussed here.

Chapter 7 Future Recommendations and Conclusion

Here future recommendation for this project and conclusion are present. The system should be tested on the real application in agricultural sector to measure its reliability.