# COMPUTER INTERFACING FOR SMART HOME SYSTEM

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**Power Electronics and Drives**

**May 2009**

" I hereby declare that I have read through this report entitle "Computer Interfacing For Smart Home System " and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronics and Drives)"

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# COMPUTER INTERFACING FOR SMART HOME SYSTEM

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**This Report Is Submitted In Partial Fulfillment Of Requirements For The Degree of Bachelor In Electrical Engineering (Power Electronics and Drives)**

**Faculty of Electrical Engineering**
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**May 2009**

I declare that this report entitle "*Computer Interfacing For Smart Home System*" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date : 11/05/2009

## DEDICATION

Specially dedicated to my beloved family especially my mother (Fatimah Binti Mohd Tap) and my father (Sulaiman Bin Samad); whose very concern, understanding, supporting and patient. Thanks for everything. To All My Friends, I also would like to say thanks. The Work and Success will never be achieved without all of you.

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Thank you.

# ABSTRACT

This project is to design software and hardware which has the ability to control and operate every electrical appliances in the house automatically by using computer which that the system can be pre-program by user. Through it, knowledge in design and using programming language for interfacing purposes can be learned and improved. The selection of the Visual Basic 6.0 program is for better fundamental understanding on computer program application in the computer interfacing. This project was separated to three main parts. The first part is designing the software for interfacing, data key in and timing which control by using Graphical User Interface (GUI). The second part is designing the hardware for the project. The third part is joining the entire component that had been design. This paper discusses various aspects of a smart home system especially using parallel port to access and controls home. The purpose of the Smart Home Project is to devise a set of smart electrical appliances to provide better home life experience without overpowering users with technologies. Interfacing takes advantage of low-cost, high-speed input or output port, and compatible with high-level languages. The conception of this project can be apply to other purposes such as for security and reduce electrical power consumption.

# ABSTRAK

Projek ini terdiri daripada perisian dan perkakasan yang direkabentuk di mana mempunyai kebolehan untuk mengawal dan menghidupkan seluruh peralatan elektrik di dalam rumah secara automatik dengan menggunakan komputer yang mana sistemnya boleh diprogramkan semula oleh pengguna. Justeru itu, pengetahuan dalam merekabentuk dan menggunakan bahasa pengaturcaraan untuk tujuan-tujuan pengantaramukaan boleh dipelajari dengan lebih baik dan dipertingkatkan. Pemilihan program Visual Basic 6.0 adalah sesuai untuk pemahaman asas pada aplikasi program komputer dalam pengantaramukaan komputer. Projek ini terbahagi kepada tiga bahagian utama. Bahagian pertama adalah merekabentuk perisian untuk pengantaramukaan, data masukkan dan masa kawalan dengan menggunakan Antara Muka Pengguna Grafik (GUI). Bahagian kedua adalah merekabentuk perkakasan projek. Bahagian ketiga pula adalah mengabungkan keseluruhan komponen yang telah direka litarnya. Tesis ini juga membincangkan pelbagai aspek sistem rumah pintar terutamanya menggunakan pengkalan selari untuk memasuki dan mengawal sistem sesebuah rumah. Rekabentuk dan pembangunan sesuatu sistem rumah pintar itu akan diterangkan dalam tesis ini. Tujuan projek ini adalah untuk mencipta satu sistem yang lebih bijak dalam pengawalan peralatan elektrik bagi menyediakan pengalaman hidup pengguna-pengguna di rumah dengan lebih baik tanpa pengguna yang ramai dengan teknologi-teknologi. Penggunaan pengantaramukaan memberi kesan kepada kos yang rendah, kelajuan pada masukan atau keluaran, dan sesuai dengan bahasa-bahasa peringkat tinggi. Pada dasarnya, konsep projek ini boleh diaplikasikan pada tujuan-tujuan yang lain seperti untuk keselamatan dan mengurangkan penggunaan kuasa elektrik.

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| | |
|---|---|
| GUI | : Graphical User Interface |
| PC | : Personal Computer |
| SPP | : Standard Parallel Port |
| EPP | : Enhanced Parallel Port |
| ECP | : Extended Capabilities Port |
| BIOS | : Basic Input / Output System |
| PPC | : Parallel Port Cards |
| GND | : Ground |
| ECR | : Extended Control Register |
| CMOS | : Complementary metal–oxide–semiconductor |
| MOSFET | : Metal Oxide Semiconductor Field Effect Transistors |
| TTL | : Transistor-Transistor Logic |
| PSM | : Projek Sarjana Muda |
| PCB | : Printer Circuit Board |
| LED | : Light Emitting Diode |

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# CHAPTER 1

# INTRODUCTION

This chapter will explain the objectives and the scope of this project. The purpose of this project of this chapter is to give an overview of this project.

## 1.1 Project Background

With the advancement in technology, computers have begun to play a more vital role in our daily lives. Nowadays, everything from microwaves to space shuttles are controlled by computer software. Our homes are no different. Due to the advances in communications and sensor technology, the turn of the century has witnessed the concept of a smart home elevated to a whole new level.

A smart home is dwelling where the appliances can communicate their status to a controller or with each other. A smart home really differs from conventional home in its communications infrastructure. The major systems in the home such as lamp, fan, security alarm syatem and so on can communicate and pass commands to each other and be controlled remotely. A smart home also is the use of one or more computers that gives homeowner to control basic home functions and features automatically and sometimes remotely.

Smart Home technology offers a range of different benefits to the consumer in terms of intelligent security, convenience and comfort. Smart home provides energy saving and safety to homeowners as much as they can live in conveniently. Smart Home help people in saving their money from paying much of the electricity bills since they can manage the usage of lights and fan properly especially those always leave their house for

vacation. For example, the lights can be programmed to switch on or off at scheduled times when the owners are away in giving the home looks like being occupied.

## 1.2 Problem Statements

Nowadays, technology becomes a vital part of our daily life. It is included in most of life aspects. One of the emerging technologies is the smart homes system technology. This technology will influence the structure of the houses. When discuss about the house management people get lazy because they do not have enough times to spend due to their daily routine. So, usually people leave their home without considering any safety precaution from robbery and always forget to switch off the lamp or any electrical equipment or device in their home.

Therefore, this project is build to save their cost when leaving their home and they can easily control their home's electrical or mechanical systems and appliances over their GUI controlled by computer.

## 1.3 Objectives

The main objectives of this project are:

i. To build prototype of Smart Home System that suitable to software.
ii. To develop computer interfacing between Personal Computer (PC) and Smart Home System.
iii. To construct Graphical User Interface (GUI) using Visual Basic 6.0
iv. To design new Home System with alarm system that user friendly.

## 1.4 Scope of Project

This project consists of a software part and hardware part. The scopes of this project are as follow:

i. The smart home system prototype which built is basically on the lighting system, fan and security alarm system using AutoCAD Software.
ii. A parallel interfacing used as the connection between the interfacing circuit and the computer.
iii. Visual Basic 6.0 used to design the graphical user interface (GUI). This interface will be programmed to control the system.
iv. Proteus / ORCAD Software used to design the interface circuit.

# CHAPTER 2

# LITERATURE REVIEW

This chapter reviews existing project created to get an idea about the project design, conception and any information that related to improve the project. There are many creations and innovations of projects that have been done by other people with differences concept and design. This chapter also covers the researches related to this project. This will provide a clearer understanding of the system and its design. The purpose of this chapter is to explain the review of the theories used to in order to implement the project. The understanding of the basic theory is a very important as a guideline. This project is all about the computer interfacing for fundamental of smart home systems.

## 2.1 Smart Home: A Peek In The Future (Author: Manish Anand, Jalal Al-Muhtadi, M. Dennis Mickunas, and Roy H. Campbell - December 1999) [1]

This paper discussed about how to build a Smart Home by writing software code for home appliances connected to the network with a JINI (pronounced GEE-nee; loosely derived from the Arabic for magician) [2] software code that makes the plugging of these appliances as simple as plugging a telephone to the telephone line using a phone jack.

In their prototype the most common household devices like door, house alarm, Refrigerator, Toaster and Video Cassette Recorder have been implemented using JINI with a very user friendly GUI to control them.

In their implementation devices can be dynamically added to the existing system and even new features can be added to existing devices dynamically. Once a new device gets plugged in, they announce their availability in the network to the Smart Home Client

GUI and now they can be called upon by anyone using this Smart Home Client with proper access permissions. When new features are added to the existing device, the interface being used to access that device gets automatically updated and the next time the client accesses this device he gets a new updated version of the interface. Current implementation of their services gives their devices one of the most desirable properties of retaining its state information. For example, if the client switches "ON" the House Alarm, the next time he accesses this device its state is shown as "ON". They are working on making our services even more intelligent by introducing the concept of callbacks which will enable their devices to automatically make the client's aware if there is a change in the state of the service. This property is especially desirable if a client wants to constantly monitor the state of a device like house alarm and would like to be notified when there is a change in the status of the Alarm. Figure 2.1 below shows the interaction between the smart home components.

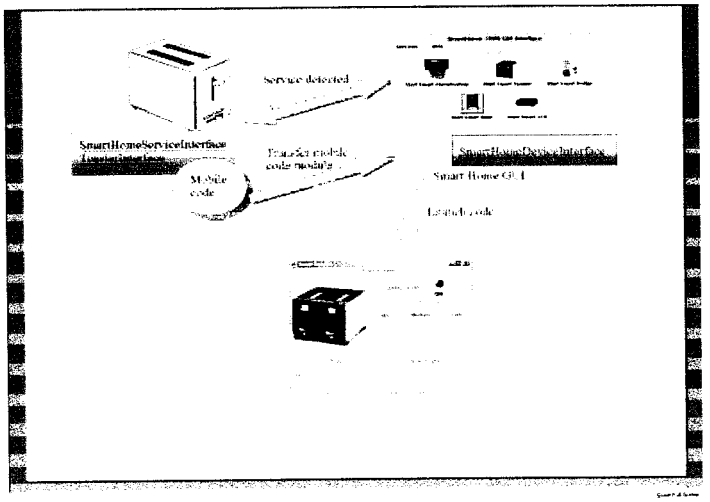

Figure 2.1: The Interaction Between The Smart Home Components [1]

Their project is a step towards realizing the distributed programmer's dream environment where the whole network is nothing but an ocean of services and devices would become available to be used as soon as they are plugged into a network. Their project is a strong determined step towards delivering the notion of "Internet appliance" leading to ubiquitous computing.

## 2.2 The Smart Home Concept: Our Immediate Future (Author: Vincent Ricquebourg, David Menga, David Durand, Bruno Marhic, Laurent Delahoche, Christophe Logé) [3]

This general paper aims at presenting the Smart Home concept. In this paper, they detail a) The Smart Home concept b) The various networks infrastructures specific to the habitat c) the concepts to model the habitat and to provide the most adapted services to the inhabitants. Contrary to the other projects, they direct their work towards a sensors approach and an ontology modeling of the Smart Home. Their work has the originality to take into account the real heterogeneity of information present in a habitat and use a Service Oriented Approach (SOA). They say that their paper is a good overview to present what is a Smart Home and which are the necessary hardware and software components to make a Smart Home. Figure 2.2 below shows the smart home concept for this paper.

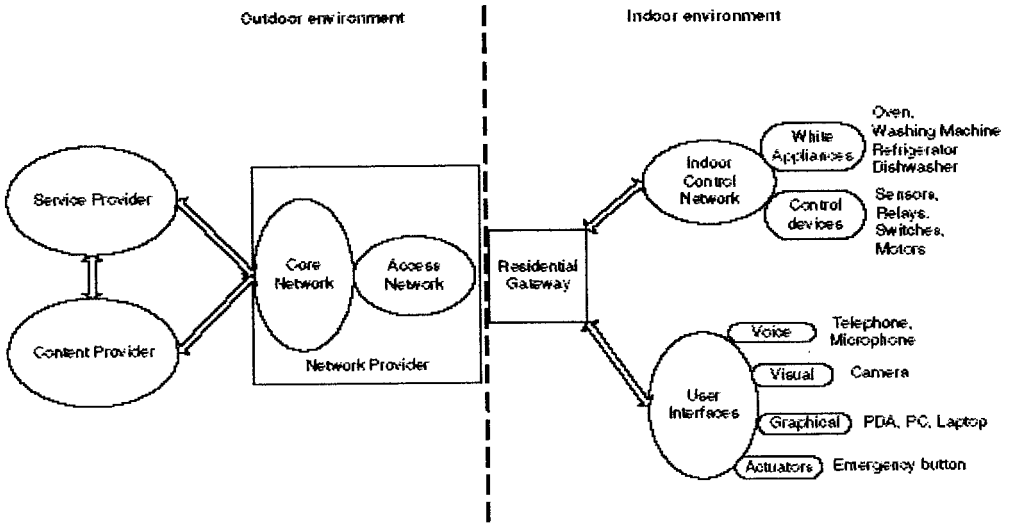


Figure 2.2: The Smart Home Concept [4]

In this paper, they present what a Smart Home is. They present which components are necessary to make a Smart Home. First, they need a network infrastructure to convey information emitted by heterogeneous smart objects. Second, they are also need a software architecture to use information. To achieve that, they use a service oriented approach to manage information and to provide the more adapted service by the way of heterogeneous sensors. To manage sensors information, they first use a publish or subscribe bus and an ontology to model and infer with contextual information.