SMART AUTOMATED HOME

MEGAT IZZUDDIN BIN MEGAT AB MANAP

MAY 2008

"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Control, Instrumentation & Automation)"

Signature	:	……
Supervisor's Name	:	Jurifa Bt Mat Lazi
Date	:	6 May 2008

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This Report Is Submitted In Partial Fulfillment of Requirements for the Degree of Bachelor in Electrical Engineering (Control, Instrumentation & Automation)

Faculty of Electrical Engineering
Universiti Teknikal Malaysia Melaka

May 2008

DECLARATION

"I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly in the references."

Signature : ……

Name : MEGAT IZZUDDIN BIN MEGAT AB MANAP

Date : 6 MAY 2008

DEDICATION

For my beloved father, Megat Abd Manap Bin Megat Husain and mother,
Arbaah Bte Mat Said, my brother and sister

ACKNOWLEDGEMENTS

First of all, I would like to express my thankfulness to Allah S.W. T who has given me the strength, knowledge and capability to implement and complete my Projek Sarjana Muda and also to complete this report.

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ABSTRACT

This project is about the construction of an automated control system for a smart home to control critical house parameters, which includes the indoor and outdoor lightings, indoor ventilation, garbage management, garden watering, garage/parking and events alert. The outdoor lightings are automatically activated when the day gets dark by using a dark detection circuit. The indoor lightings are equipped with dimmers and the switches are relocated to more strategic locations. The indoor ventilation is connected to a temperature sensing circuit which controls a pair of ventilation fans to lower the indoor temperature. The garbage management automatically takes care of the garbage according to the collection schedule. The garden watering will be automatically activated according the time. The garage/parking system are designed to be safer and more convenient for the occupants while the event alert warns its occupant of possible danger. The operation for each parameters are represented on a scale model. The system utilizes the use of Programmable Logic Controller (PLC) and Integrated Circuit (IC) to create an interconnected control system. Each system are connected with other common input and output devices such as motors, switches, sensors, lights, relays etc.

ABSTRAK

Projek ini adalah berkenaan tentang pembinaan suatu sistem kawalan automatik utk rumah pintar untuk mengawal bahagian-bahagian penting rumah termasuklah lampu dalaman dan lampu luaran, ventilasi dalam rumah, pengurusan sampah, pengairan taman, tempat letak kereta dan juga amaran awal. Lampu luar boleh dihidupkan secara automatik mengunakan litar mengesan kepekaan cahaya. Lampu dalaman pula telah dilengkapi dengan pemalap dan suis akan ditempatkan semula di tempat yang lebih strategik. Ventilasi dalam rumah akan disambungkan dengan litar pengesan kepekaan haba yang mengawal sepasang kipas ventilasi utk menurunkan suhu di dalam rumah. Pengurusan sampah pula menguruskan sampah mengikut waktu kutipan sampah. Pengairan taman juga akan dihidupkan secara automatik mengikut waktu. Tempat letak kereta akan direka untuk menjadi lebih selamat dan lebih mudah untuk penghuni manakala amaran awal memberi amaran tentang bahaya yang bakal menimpa. Operasi untuk setiap bahagian diwakilkan pada model skala. Sistem ini akan mengaplikasikan pengunaan Pengawal Logik Aturcara (PLC) dan Litar terbina dalam (IC) untuk mencipta suatu sistem kawalan. Setiap sistem disambungkan dengan input dan output seperti motor, suis, sensor, lampu, geganti dan lain-lain.

TABLE OF CONTENTS

2 LITERATURE REVIEW

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

ABBREVIATIONS	MEANING
CCTV	Closed circuit television
DC	Direct current
AC	Alternating current
IC	Integrated circuit
LCD	Liquid crystal display
LDR	Light dependant resistor
LED	Light emitting diode
PLC	Programmable logic controller
PIC	Programmable interface controller
PWM	Pulse Width Modulation
NO	Normally open
NC	Normally close

CHAPTER 1

INTRODUCTION

1.1 Project Background

This chapter provides the necessary background for this project, which explains the basic principle of PLC and IC control system.

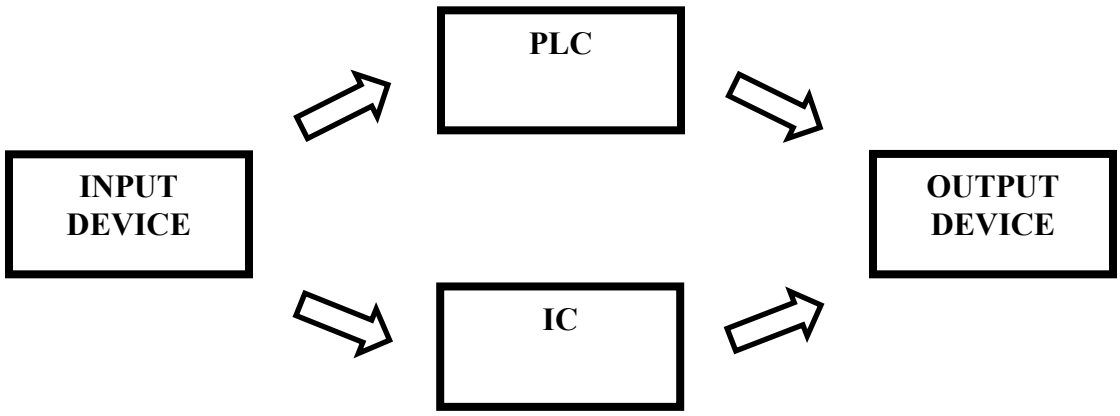

Figure 1.1: Block Diagram of control system using PLC and IC

To create a control system, it must have 3 basic components which are input, process and output. The process consists of the PLC and IC which acts as input signal processing device to control the output. A brief introduction to the concept of application is given to provide basic understanding of this project.

The input device comes in the form of ordinary on/off limit switches, push buttons, variable resistors, photo-electric sensors, proximity sensor, light dependent resistors (LDR) and thermistors. These devices provide the activation signal in the form of analog or digital signal to the control unit.

The controller part which is the PLC and the IC acts as the primary control unit for this project. In this system, the PLC controller used is the Omron ZEN micro PLC unit. The input signals are transmitted digitally into the PLC and an appropriate

–decision" will be made by the PLC according to the programmed ladder logic diagram. The PLC will then produce a digital signal in the form of relay output. The PLC is chosen over PIC to provide control for this project due to its multiple inputs and output arrangements and also its easy and user friendly programming using ladder logic diagram. The key feature for the PLC that is used is the built in daily, weekly and monthly timer capability which provides useful control for time controlled operation.

The IC is used for analog signal processing which involves decision making through logic gates combination and comparing two or more sets of input signals. There are two main advantages of ICs over discrete circuits which is the cost and performance. Cost is low because the chips, with all their components, are printed as a unit by photolithography and not constructed a transistor at a time. Performance is high since the components switch quickly and consume little power, because the components are small and close together.

For this project, the control is divided into two control devices which are the PLC and the IC. The purpose for this design is to fully utilize the advantages of both devices. The PLC has the advantage of easy programming, multiple relay outputs and enables systematic & organized wiring to be implemented. The IC on the other hand has the advantage of miniature size, low costs and provides tons of function according to the circuit it is connected. By combining two forms of these widely used devices, a good and reliable control system can be created to cater the project's needs.

The output device will be in the form of relays, buzzer, DC motors, tweeter, lights, LEDs and fans. These devices receive activation signal from the PLC, IC or directly from the input device and perform various functions including illumination, cooling and etc.

1.2 Problem Statement

This project like all others is created to solve problems that we humans encounter everyday. Upon completion of this project, the problems that we face will hopefully be solved or at least reduced. To make it easier to explain regarding the problem statements, they are divided into two parts, which is general aspect and detailed according to the system arrangements

1.2.1 General Problem Statement

- There is no training kit that emphasizes the combination between PLC and electronics based circuits.
- Most training kit available focuses on industrial system but not home automation system.
- Available home automation has limited control over devices/system and costly.
- Normal homes are inconvenience, not safe and not economical.

1.2.2 Detailed Problem Statement

- For the indoor lightings, the lights switches are located far away, not easily to access locations and the lights cannot be dimmed.
- The outdoor lights needs to be turned on and off manually at day & night and sometimes the occupant forgot to turn them off. This causes wastage in electricity bills.
- The temperature inside (indoor) are hot and unpleasant. The hot/warm air is trapped inside house due to poor ventilation
- The occupant missed the weekly garbage collection time and the garbage spilled when bringing it outside the house. Furthermore, the odor from the garbage attracts flies & disease.
- Plants at the garden die due to lack of watering and the gardens are infected by pests.
- Accidentally hit the garage wall/children while reversing the vehicle and sometimes the occupant forgets to close the garage door
- House does not have fire and flood warning system.

1.3 Project Objective

The objective of this project is to design & construct a control system which consists of home automation and lighting control that can be used for various purpose especially teaching & learning and home application.

The lighting control is used to control the illumination and brightness for the indoor and outdoor lightings while the home automation is used to control the indoor ventilation, garbage disposal, garden management, garage/car park and events alert.

1.4 Project Scope

Scope and limitations for this project:

- Design and construction of a control system consist of home automation and lighting control.
- Constructed using PLC, Electronic circuits, DC motors, sensors, switches, relays etc.
- The model design & construction consists of small scale model that represents the connection and function of the system.
- System powered by DC source through switching power supply and voltage regulators.
- Lighting
    i. Indoor
    ii. Outdoor
- Home automation
    i. Ventilation (Indoor)
    ii. Garbage disposal
    iii. Garden management
    iv. Garage/car park
    v. Events alert