PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS
Doña Lawa-an H. Lopez Campus
Iloilo City

COMPUTER CONTROLLED HOUSE: A PISAY PROTOTYPE

1ST PLACE

Cluster 2 Team Category
2000-2001 Intel Philippine Science Fair Regional Finals
Sum-ag National High School, Bacolod City, Negros Occidental
February 7-9, 2001

OFFICIAL ENTRY

Cluster 2 Team Category
2000-2001 Intel Philippine Science Fair National Finals
UP Ang Bahay ng Alumni, Diliman, Quezon City
March 13-16, 2001

COMPUTER-CONTROLLED HOUSE: A PISAY PROTOTYPE

A research paper presented to the

Faculty of the Philippine Science High School Western Visayas

Iloilo City

In partial fulfillment

Of the Requirements in

Technology Research II

By:

Justin Jon L. Jereza

Jose Marie G. Sumbing

Jonathan Noel I. Yang

March 2001

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS

Doña Lawa-an H. Lopez Campus
Iloilo City

COMPUTER-CONTROLLED HOUSE: A PISAY PROTOTYPE

APPROVAL SHEET

A Research Paper Requirement

for Technology Research II

by

Justin Jon L. Jereza
Jose Marie G. Sumbing
Jonathan Noel I. Yang

Approved by the Research Committee:

MARVIN L. CADORNIGARA, Adviser/ Chairperson

ALBERTO G. TANOY, Member

JOSE G. MARAVILLA III, Member

YZ V. BARRIENTOS, Member

REBECCA V. YANDOG
Director III

March 2001

June 8, 2001 ACCESSION

T305

ACKNOWLEDGEMENT

This study was made possible through the unselfish support of the following people, whom the researchers are deeply indebted to:

Mrs. Rebecca V. Yandog, PSHSWV Director, for believing in our dreams and capabilities;

Mr. Edgar F. Almero, PSHSWV CISSD Chief, Mrs. Rose Elizabeth A. Espinosa, PSHSWV SMT Unit Coordinator, and Mrs. Evaline Rose Gerochi, PSHSWV SSD Chief, for their untiring guidance and academic support;

Mr. Marvin L. Cadornigara, project adviser, for his nurturing guidance and technical advice;

Mr. and Mrs. Roberto Jereza, Mr. and Mrs. Elmer Sumbing, and Mr. and Mrs. Jimmy Yang, for their loving concern and financial assistance;

Miss Yz V. Barrientos, for her technical assistance in the preparation of this research paper;

Mr. Jose G. Maravilla III, Mr. Alberto G. Tanoy, and Mr. Jose Leo G. Redoblo for their encouraging presence and involvement throughout the conduct of the study;

The members of the PSHSWV Academic and Support Divisions, for their concern, understanding and academic interventions;

Andrew Paulo S. Robillo, for sharing his expertise and resources with us;

The students of the powerful IV-Tau, for constantly believing in us;

And most of all, God Almighty for without Him, we would be lost.

JUSTIN JON L. JEREZA

JOSE MARIE G. SUMBING

JONATHAN NOEL I. YANG

March 2001

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS
Doña Lawa-an H. Lopez Campus
Iloilo City

Jereza, Justin Jon L.; Sumbing, Jose Marie G.; and Yang, Jonathan Noel I. "Computer-Controlled Houses: A Pinay Prototype", Unpublished Research II Paper, Philippine Science High School Western Visayas, Iloilo City, March 2001.

Abstract

This One Spot Case Study aimed to determine the feasibility of a computer-controlled house that can be operated by a computer program developed using C++. This program determined if the prototype could operate electrical loads such as light emitting diodes and dynamos in the model house. It also determined the capability of the program in terms of automation and password protection. The whole process of constructing the prototype of a computer-controlled house involved program development, design and assembly of computer interface and power supply, construction of the computer-controlled house, and capabilities testing.

This study proved that a computer-controlled house is feasible using a specially developed C++ program. The prototype was able to operate electrical loads such as light emitting diodes and dynamos inside the house all at the same time, one at a time, and in any combination of these loads. The computer program, furthermore, was able to operate the automation of the above mentioned electrical loads given a set time. The program can also be secured through password protection.*

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS

Doña Lawa-an H. Lopez Campus

Iloilo City

Computer-Controlled House: A PSHS WV Prototype

Chapter 1

Introduction

Background of the Study

Human technology during this era is advancing rapidly. However, our country, the Philippines, was once at par with other advanced and industrialized nations, but only through the support of some highly advanced countries and their various technological donations. It is now time for us to start developing new technologies not just in agriculture but also in other fields as well.

This century may have been known as the century of Physics. It has ushered an era where a dream has enabled mankind to fly, place themselves on the moon, and compress millions of transistors into a single microchip. What has our country contributed to these global advancements in science? It is time that our country starts thinking about developing new technologies, if it is to be able to face the new century.

Probably the most popular and useful form of technological advancement is that of automation. It makes use of the newest computing and communication technologies to take over either mundane or difficult tasks. Exhausting mental and physical tasks can now be done at the pull of a switch or a touch of a button. Automation, in other words, makes everyday life easier.

Nowadays, automation has enabled the production and development of certain helpful machines and systems. These complex contraptions aid in tasks that make living effortless and convenient to humans.

With these facts in mind, the researchers were struck by the idea of demonstrating to the public a model of a house, whose electrical facilities could be controlled by a computer. This demonstration did not only cover what the computer can do, but it also demonstrated the operation of an automated system.

Since our country today is beset with serious financial problems, and any new technological breakthrough must not only be practical but also economical, the researchers decided to make use of low-cost materials and components in their attempt to build a prototype house controlled by a computer program that they themselves created.

In this study, the independent factor was the computer program. The dependent factors were the ability of such program

to operate all the electrical loads in the prototype house, such as the five light emitting diodes (LEDs) and two dynamos, either all at the same time, one at a time, and in any combination of these loads; and to demonstrate automation and password security.

The relationship between these factors of the study is presented in Figure 1.

Statement of the Problem

This study aimed to determine the feasibility of a computer-controlled house.

Specifically, this study answered the following questions:

1. Is it feasible to have a prototype of a computer-controlled house?

2. Can the computer-controlled house be programmed to operate electrical loads such as light emitting diodes and dynamos (a) all at the same time, (b) one at a time, and (c) in any combination of these loads?

3. Can the computer program operate the automation of the above-mentioned electrical loads given a set time?

4. Can the program operating the computer-controlled house be secured through password protection?

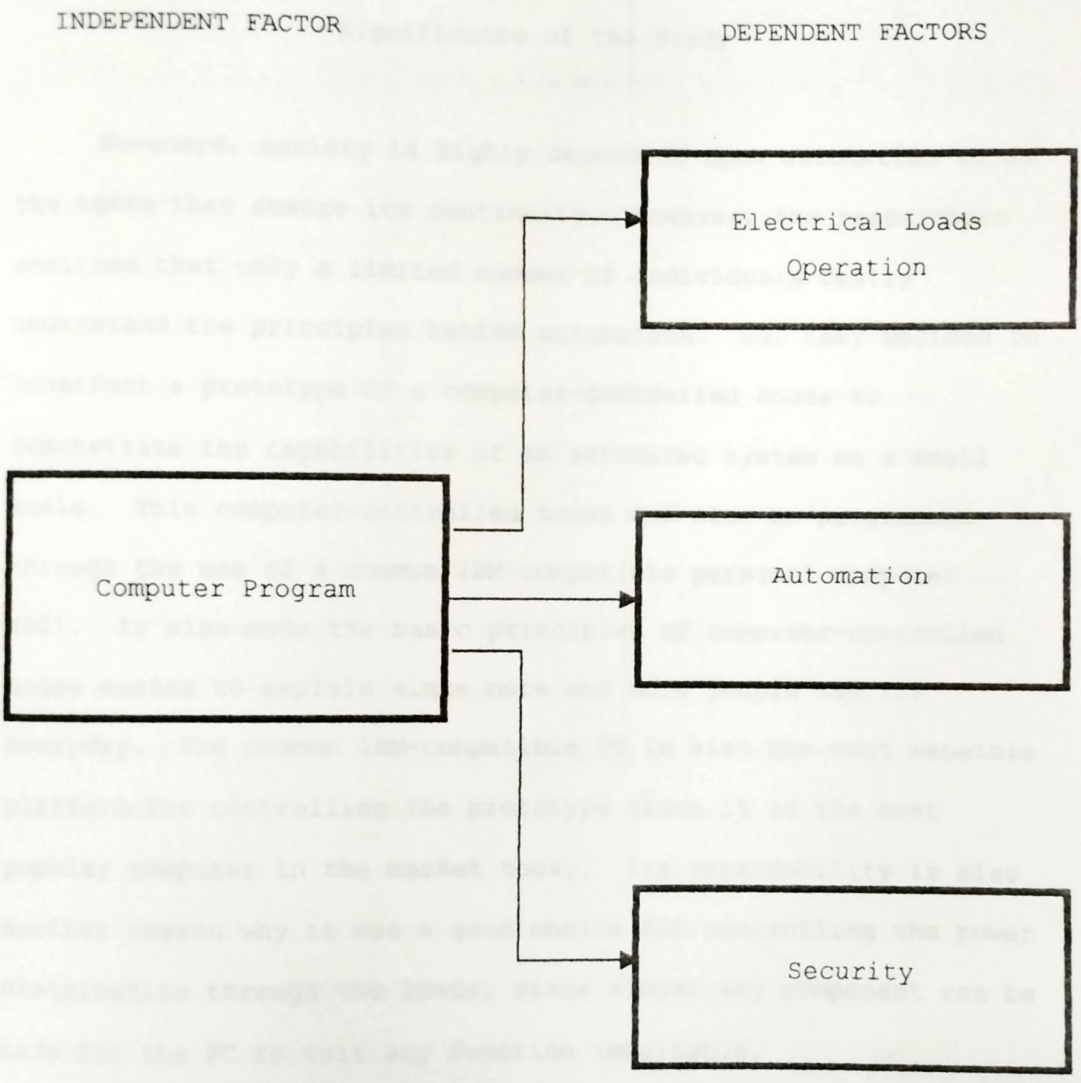

Figure 1. Capabilities of the computer program in terms of its electrical load operations, automation and security in the prototype house.

Significance of the Study

Nowadays, society is highly dependent upon automation to do the tasks that ensure its continuity. However, the researchers realized that only a limited number of individuals really understand the principles behind automation. So, they decided to construct a prototype of a computer-controlled house to demonstrate the capabilities of an automated system on a small scale. This computer-controlled house can also be programmed through the use of a common IBM-compatible personal computer (PC). It also made the basic principles of computer-controlled house easier to explain since more and more people use PCs everyday. The common IBM-compatible PC is also the most sensible platform for controlling the prototype since it is the most popular computer in the market today. Its expandability is also another reason why it was a good choice for controlling the power distribution through the loads, since almost any component can be made for the PC to suit any function imaginable.

Definition of Terms

Some key terms in this study need definition for the purpose of achieving understanding and single-mindedness:

Computer- is an apparatus built to perform routine calculations with speed, reliability, and ease; in addition to this basic function, the advance of technology has enabled computers to provide numerous services for an ever-increasing number of people (The Grolier Multimedia Encyclopedia, 1998).

In this study, the "computer" is used to develop a program that facilitated input signals to the interface, which in turn sent signals to the electrical loads.

Control- is the application of the principles of automation to the continuity of mechanical operations of a machine (The Grolier Multimedia Encyclopedia).

In this study, the term "control" refers to the process by which the computer commands the circuit connected to the electrical loads by the input of the user in the computer.

Load- is a device or the resistance of a device to which a machine acts (Microsoft Encarta Encyclopedia, 1997).

In this study, "loads" refers to the electrical components used in the study, i.e., the light emitting diodes (LEDs) and dynamos.

Program- is a list of instructions that control the operation of a computer (Grolier International, 1991).

In this study, the "program" refers to the system developed through a language, C++.

Prototype- is an original thing or person in relation to any copy, imitation, representation, later specimen, improved form, etc. (The New Oxford Encyclopedic Dictionary, 1993).

In this study, the "prototype" refers to the whole system developed, i.e., the computer program and the electrical loads constructed in the model house.

Operation- is the action or way a thing works (The New Oxford Encyclopedic Dictionary).

In this study, "operation" refers to the ability of the program to turn on or off the electrical loads either all at the same time, one at a time, and in any combination of these loads; it also includes the ability to automate its functions and secure itself through a password.

Scope and Delimitation of the Study

This study aimed to determine the feasibility of a computer-controlled house that can be operated by a computer program developed using C++.

This program operated electrical loads such as light emitting diodes (LEDs) and dynamos either altogether, one at a time, or in any combination of these loads in the house. This computer program also operated the automation of the above-mentioned electrical loads given a set time and regulated its password protection.

This study was conceived last February 2000 and was started November 2000. The program was created at the PSHSWV Computer Science Laboratory while the electrical and structural components were assembled at the PSHSWV Physics Laboratory.

Chapter 2

Review of Related Literature

Automation

Automation is simply the integration of machine tools in a fully automatic and, in some cases, self-regulating system. Automation today means considerably more than the coordination of a series of machines. It is now being applied in business and industry. A list of ways in which automation is applied would include such activities as automatic piloting of an aircraft, making cars, medical diagnosis, directing traffic and many other similar tasks (Collier's Encyclopedia, 1995).

It also describes non-manufacturing systems in which programmed or automatic devices can operate independently or nearly independently of human control. In the fields of communications, aviation, and aeronautics, for example, such devices as automatic telephone switching equipment, automatic pilots, and automated guidance and control systems are used to perform various operations much faster or better than could be accomplished by humans (Encarta Encyclopedia, 1997).

Development in this field is a result of advances in the design of machines. Although early machines were often

complicated, most were designed to operate under a specific set of conditions; when this condition changed, a manual adjustment was necessary to assure proper operation. This was not a major shortcoming, since machines operated at low speeds. During the Industrial Revolution of the late 1700's and the 1800's, however, more sophisticated machines were developed and applied to situation requiring a faster response than was possible with manual adjustment. This need led to the concept of automation. An automated system adjusts its operations in response to changing external conditions in three steps: measurement, evaluation, and control (Grolier International, 1991).

The C++ Programming Language

C++ is a general purpose programming language designed to make programming more enjoyable for the serious programmer. Except for minor differences, C++ is a superset of the C programming language. The key concept in C++ is "class". A class is a user-defined type. Classes provide data hiding, guaranteed initialization of data, implicit type conversion for user-defined types, dynamic typing, user-controlled memory management, and mechanisms for overloading operators. C++ provides much better facilities for expressing modularity than C does. C++ retains

C's ability to deal efficiently with the fundamental objects of hardware (bits, bytes, word, addresses, etc.). This allows the user-defined types to be implemented with a pleasing degree of efficiency (Stroustrup, 1986).

Digital Signals

Digital signals, in digital circuits, have only two distinguished voltage levels: the logic 0 (LOW), which is about 0 volts or near ground potential and logic 1 (HIGH), which is about 3 to 5 volts (Kershaw, 1998).

Logic Gate

A logic gate is logic circuit with two or more inputs and a single output. It is a circuit that produces the electrical equivalent of a logical function. The inputs and output can only be digital signals, the logic 0 and 1-voltage levels. In general, the output of a logic gate will be 1 or 0, depending on the combination of 0 and 1 levels applied to its inputs. The term gate is derived from the fact that a digital signal can be applied at one input to the logic gate, and the remaining input or inputs can be used to enable or stop the passage of signal,

like opening or closing a gate. A logic gate is represented by its equivalent circuit symbol used to visualize its place in a circuit. Its Boolean expression or its truth table for logic analysis of digital circuits commonly describe it (Stanley, 1995).

Summary

Automation is simply the integration of machine tools in a fully automatic and, in some cases, self-regulating system. It also describes non-manufacturing systems in which programmed or automatic devices can operate independently or nearly independently of human control. A programming language, C++, which is known for its ability to handle hardwares, was used to develop an easier graphical interface for the user. This program could send digital signals through the parallel port. These digital signals will then be processed by the computer interface, which uses logic gates and other electronic devices, which could transform these signals into analog signals. These articles support the idea of creating a prototype of a computer-controlled house.

Chapter 3

Research Design and Methodology

This study aimed to determine the feasibility of a house whose electrical facilities could be controlled by a computer.

Specifically it will determine if a prototype of a computer-controlled house is feasible. It also determined if the computer-controlled house could be programmed to operate electrical loads such as light emitting diodes and dynamos (a) all at the same time, (b) one at a time, and (c) in any combination of these loads. Furthermore, this study also determined if the computer program could operate the automation of the above-mentioned electrical loads given a set time. Finally, this study determined if the program operating the computer-controlled house could be secured through password protection.

Research Design

The One Spot Case Study Design was employed in this study. After the electrical loads of the computer-controlled house were assembled, the capabilities of the computer program to operate the electrical loads either all at the same time, one at a time, and in any combination of these loads were determined.

Methods

The whole process of constructing the prototype of a computer-controlled house involved the following methods: (1) gathering of materials and equipment, (2) design and assembly of the five-volt and twelve-volt power supply, (3) design and assembly of the computer interface, (4) developing the program, (5) design and construction of the computer-controlled house, and finally (6) capabilities testing.

Gathering of Materials and Equipment

A 5 volt-regulated power supply was needed for the computer interface. This consisted of a transformer, light emitting diodes, resistors, capacitors, voltage regulator integrated circuit, and transistors. This also needed a 1-Ampere Bridge

Rectifier, a 2200-Microfarad 16-Volt Electrolytic Capacitor, and an LM7805CT Positive 1.5-Ampere 5-Volt Voltage Regulator (TO-220).

For the computer interface, three 74LS367N 4-bit and 2-bit hex buffer Integrated Circuits (ICs) were purchased.

The house made use of plywood, illustration boards, Styrofoam, and other art materials for the structural part of the house. Electrical wires were also used to connect the loads to the power supply.

Finally a 100% IBM-PC Compatible Computer was used for the development of the computer application using C++.

Design and Assembly of the Five-Volt Power Supply

The researchers designed the circuit of this power supply. In assembling the 5-volt regulated power supply for the computer interface, a transformer, bridge rectifier, a capacitor, a voltage regulator and a light emitting diode were used.

The components were then attached to the breadboard. A regulated power supply is a better power source than a normal power supply because it reduced hum noise and voltage ripples to a minimum.

Design and Assembly of the Twelve-Volt Regulated Power Supply

In assembling the 12-volt power supply for the secondary circuit, a transformer, a bridge rectifier, a capacitor, a resistor and a light emitting diode were used.

The components were then attached to the breadboard.

Design and Assembly of the Computer Interface

This computer interface was also designed and assembled by the researchers with the knowledge of what and how each component worked when connected to other components.

This interface was composed of three 74LS367N two-bit/four-bit tri-state hex buffer ICs (Appendix A) which served as a buffer between the PC and the secondary circuit. These components were also attached to the breadboard. A 5-volt output was needed because in digital electronics, the low state is about 0 volts while the high state is 5 volts.

Developing the Program

Since this language was known for its ability to control hardware, C++ was the programming language used in developing the program that controlled the operations of the electric loads in this study (Stroustrup, 1986). The program was designed in such a way that a graphical user interface was displayed, and the

users use the mouse to specify which of the loads they like to operate and when they want it to operate. The port sent a signal to the interface, and the interface translated it into electrical signals to the loads in the house.

In this programming, the following basic steps (in Schildt, 1992) were followed:

1. Declaration of the Header Files

This instructed the compiler to include an existing source file in order to maximize the necessary functions contained in them.

2. Definition of Identifiers

Identifiers were then established in order for them to designate specific values necessary in the program.

3. Class Declarations

The class, which is syntactically similar to a structure, is the root of C++. Before an object was created, a keyword class was necessary to define the general form of such object.

4. Function Prototype

The functions used in the program were defined in terms of its identifiers and types.

5. Global Declarations

The global declarations declared the constant and variables that were accessible to the whole program.

a. Constant Declaration

Identifiers were given corresponding values, which were called constants.

b. Variable Declaration

Some values varied as the program was compiled. Some identifiers were declared as variables with its corresponding data type.

6. Main Program

The main program used combinations of keywords, functions, parameters, identifiers, and symbols, which followed the syntax of the C++ programming language.

I. Local Declarations

The local declarations declared the constants and variables that were accessible only within a function.

a. Constant Declaration

Identifiers were given corresponding values, which were called constants.

b. Variable Declaration

Some values varied as the program was compiled.

Some identifiers were declared as variables with its corresponding data type.

II. Source Code

This connected all functions, identifiers, constants, and variables.

7. Class Methods

This set the appropriate functions for a particular class in the program.

8. Functions

This established the building blocks of C++ in which all program activities occurred.

Design and Construction of the Computer-Controlled House

The layout of the house was drawn on a Manila paper and then duplicated to the plywood. The plywood was then cut according to the layout. The plywood was then erected into a house using small nails. Divisions were placed inside to make a room for each load. A semi-transparent window was made so that the lights from each LED would be visible. The loads were then placed in each room. Using art materials, some decorations were applied. Finally, each room was labeled, i.e., living room, bedroom, and dining room.

Capabilities Testing

After developing the program and the circuit for the loads in the house, the researchers tested the abilities of the whole system. The system was tested whether it could switch on or off the loads all at the same time, one by one, or any combination of these loads. The system was then tested whether the loads could be set when to operate at a certain time. The system was further subjected to security testing.

Chapter 4

Results and Discussions

This study aimed to determine the feasibility of a house whose electrical facilities could be controlled by a computer.

Specifically it will determine if a prototype of a computer-controlled house is feasible. It will also determine if the computer-controlled house can be programmed to operate electrical loads such as light emitting diodes and dynamos (a) all at the same time, (b) one at a time, and (c) in any combination of these loads.

Furthermore, this study will also determine if the computer program can operate the automation of the above-mentioned electrical loads given a set time.

Finally, this study will also determine if the program operating the computer-controlled house can be secured through password protection.

Feasibility of developing a computer-controlled house. A computer-controlled house was feasible using a specially developed C++ program.

Electrical loads operation using the program. The prototype of a computer-controlled house was able to operate electrical loads such as light emitting diodes (LEDs) and dynamos.

The program was able to operate the electrical loads in the house all at the same time, i.e., all LEDs lighted up while the dynamos rotated. The same program was able to operate the electrical loads in the house one at a time, i.e., each of the LEDs and the dynamos lighted up and rotated, respectively, one by one as prompted. The same capability of the said program was established when any combinations of these loads were tested.

Automation of the electrical loads at a given set time. The computer program, furthermore, was able to operate the automation of the above mentioned electrical loads given a set time.

Security of the computer-controlled house through password protection. Password protection was established for the program in terms of its electrical loads operation.

Chapter 5

Summary, Conclusions and Recommendations

This study aimed to determine the feasibility of a house whose electrical facilities could be controlled by a computer.

Specifically it determined if a prototype of a computer-controlled house is feasible. It also determined if the computer-controlled house can be programmed to operate electrical loads such as light emitting diodes and dynamos (a) all at the same time, (b) one at a time, and (c) in any combination of these loads.

Furthermore, this study also determined if the computer program could operate the automation of the above-mentioned electrical loads given a set time.

Finally, this study determined if the program operating the computer-controlled house could be secured through password protection.

Findings

Based on the results of the study, the researchers were able to establish the following findings:

1. A computer-controlled house was feasible using a specially developed C++ program.

2.a. The program was able to operate the electrical loads in the house all at the same time, i.e., all LEDs lighted up while the dynamos rotated.

2.b. The same program was able to operate the electrical loads in the house one at a time, i.e., each of the LEDs and the dynamos lighted up and rotated, respectively, one by one as prompted.

2.c. The same capability of the said program was established when any combinations of these loads were tested.

3. The computer program, furthermore, was able to operate the automation of the above mentioned electrical loads given a set time.

4. Password protection was established for the program in terms of its electrical loads operation.

Conclusions

A computer-controlled house was feasible using a specially developed C++ program created by the researchers.

The prototype was able to operate electrical loads such as light emitting diodes (LEDs) and dynamos inside the house all at the same time, one at a time, and in any combination of these loads. The computer program, furthermore, was able to operate the automation of the above mentioned electrical loads given a set time. The program can also be secured through password protection.

Recommendations

C++ is capable of creating a program for the operation of electric loads. This study recommends that the same language be used by computer-oriented student in creating other programs for other capabilities that would suit their goals and preferences.

It is also recommended that the program be tested on electrical loads with greater voltage requirements. The program capabilities shall also be tested on a larger scale, i.e., larger house structure, and greater number of electrical loads.

References

Collier's Encyclopedia. (1995). New York: P.F. Collier, L.P.

Electronic Enthusiasts Projects and Circuits vol.1 to 5. (1982). Philippines: Electronic Hobbyist Publishing House.

Encyclopædia Britannica. (1993). New York: Encyclopædia Britannica, Incorporated.

Grolier International. (1991). Connecticut: Grolier Incorporated.

Kershaw, J. D. (1998). Digital Electronics Logic and Systems. USA: Delmar Publishers Incorporated.

Microsoft Encarta 97 Encyclopedia. (1997). USA: Microsoft Corporation.

Norton, P., Aitken, P., Wilton, R. (1993). The Peter Norton PC Programmers Bible. USA: Microsoft Press.

Stanley, W. D. (1995). Principles of Electronic Devices. New Jersey: Prentice Hall Incorporated.

Stroustrup, B. (1986). The C++ Programming Language. USA: Bell Telephone Laboratories, Incorporated.

The 1998 Grolier Multimedia Encyclopedia. (1998). USA: Grolier Interactive, Incorporated.

Schildt, H. (1992). Turbo C/C++: The Complete Reference, Second Edition. USA: McGraw-Hill, Incorporated

APPENDIX A

Computer Program (Source Code)

```
{This is the program developed by the researchers using C++}

#include <dos.h>
#include <math.h>
#include <ctype.h>
#include <stdio.h>
#include <conio.h>
#include <string.h>
#include <stdlib.h>
#include <graphics.h>

#include <defs.h>
#include <mouse.h>
#include <window.h>
#include <button.h>

#include "ctd.cpp"
#include "dtable.cpp"
#include "password.cpp"

void main(){
int
   GraphDriver = VGA,
   GraphMode = VGAHI;

WINDOW
   main;

BUTTON
   lock,
   pass,
   exit;

   clrscr();
   initgraph(&GraphDriver,
&GraphMode, "C:\\TC\\BGI\\");


   main.x1 = 25;
   main.y1 = 25;
   main.x2 = getmaxx() - 25;
   main.y2 = getmaxy() - 25;

   refresh:
   mouse.SHOW();
   mouse.HIDE();

   cleardevice();
   main.DRAW();

   setcolor(LIGHTGREEN);

settextjustify(CENTER_TEXT,
CENTER_TEXT);
   settextstyle(DEFAULT_FONT,
HORIZ_DIR, 3);
   outtextxy(320, 43, "Device
Commander System");

   settextjustify(LEFT_TEXT,
TOP_TEXT);
   settextstyle(DEFAULT_FONT,
HORIZ_DIR, 0);
   outtextxy(45, 15,
"Philippine Science High
School Western Visayas");
   outtextxy(30, 457, "Justin
Jon L. Jereza");
   outtextxy(469, 457,
"Version 2.0 2001");

   settextstyle(DEFAULT_FONT,
VERT_DIR, 0);
   outtextxy(20, 280, "Jose
Marie G. Sumbing");
   outtextxy(20, 80,
"Jonathan Noel I. Yang");

   line(20, 63, 35, 63);
   line(85, 63, 250, 63);
   line(390, 63, 554, 63);
   line(603, 63, 619, 63);
   line(20, 74, 619, 74);

   lock.x = 60;
   lock.y = 63;
   lock.text = "Lock";
```

```
   lock.DRAW();

   pass.x = 320;
   pass.y = 63;
   pass.text = "Change
Password";

   pass.DRAW();

   exit.x = 579;
   exit.y = 63;
   exit.text = "Exit";

   exit.DRAW();

   DTABLE(FALSE);
   mouse.SHOW();

   mouse.SHOW();

   while(TRUE){
      mouse.POLL();
      CURRENT_TIME();

      if (lock.POLL() ==
RELEASED){
         LOCK();
         goto refresh;
      }
      if (pass.POLL() ==
RELEASED){
      }
      if (exit.POLL() ==
RELEASED){
         break;
      }

      DTABLE(TRUE);
   }

   closegraph();
}
```