

Smart Classroom Using LabVIEW

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This report is submitted in partial fulfillment of the requirements for award of Bachelor of Electronic Engineering (Industrial Electronics) With Honours

Faculty of Electronic and Computer Engineering
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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN
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BORANG PENGESAHAN STATUS LAPORAN

PROJEK SARJANA MUDA II

Tajuk Projek : Smart Classroom Using LabVIEW

Sesi Pengajian :

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Dedicated to my beloved family especially my father and mother, lecturer, and also to
all my friends

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ABSTRACT

Smart Classroom Using LabVIEW is a system that created to minimize the usage of the energy and study the energy saving by implement the sensor to the project. Sensors will switch on/off the classroom power supply when detect the appearance of students. Besides that, another function of the project is by using the time arrangement to control the power supply of the classroom. The main objectives of the project are to prevent the energy waste to save our environment, to save the electricity cost of university and tax payers. LabVIEW had been used for this project and design front panel of the sensor mode and schedule mode. The front panel of the program is friendly use to most lecturers because easy to understand by just select the mode. When using the schedule mode, lecturers need to arrange the time table in the program and the system will switch on and off the power supply with the time given in the program. When lecturers switch the system to sensor mode, the sensor will start send the signal to DAQ whether there have any appearance in the classroom or not, if yes, the sensor will come out with 1.4VDC output signal to DAQ analog port and switch on the power supply by digital port. If no student presence, the output will remain off mode. DAQ is a data acquisition that used in the system to interface between the PC and hardware; it is a very useful device that can use for multipurpose measurement. For further application, this system can use for commercialize with home, office, classroom and so on.

ABSTRAK

Smart Classroom Using LabVIEW adalah sebuah sistem yang diciptakan untuk mengurangkan penggunaan kuasa dan membuat kajian atas penjimatan kuasa apabila sensor digunakan dalam projek ini. Sensor-sensor akan mengawal pembekalan elektrik dengan mengesan penampilan pelajar-pelajar dalam bilik kuliah tersebut. Selain itu, satu lagi fungsi untuk projek ini adalah mengawal bekalan elektrik dengan menggunakan penetapan masa ataupun dengan jadual waktu. Objektif-objektif untuk projek ini adalah mengurangkan pembaziran kuasa untuk menyelamatkan alam sekitar dan menjimatkan kos kuasa elektrik untuk universiti dan pembayar cukai. LabVIEW telah digunakan untuk projek ini dengan rekabentuk front panel dalam dua situasi, satu ialah schedule (jadual waktu) mode, yang kedua ialah sensor mode. Front panel untuk program ini direka dengan penggunaan yang senang difahami oleh kebanyakan pensyarah dengan pemilihan schedule ataupun sensor mode. Kalau pensyarah telah memilih schedule mode, pensyarah perlu memasuki masa yang telah ditetapkan, sistem ini akan mengawal pembekalan elektrik dengan masa yang telah diberi oleh pensyarah tersebut. Kalau pensyarah telah memilih sensor mode, sensor-sensor akan mula mengesan penampilan pelajar dan pensyarah, jika ada penampilan, sensor akan mengeluarkan 1.4VDC output sebagai isyarat kepada analog port DAQ dan digital port akan mengeluarkan signal untuk menghidupkan pembekalan elektrik. Jika tiada penampilan dikesan, tiada output yang akan keluar dan pembekalan masih dimatikan. DAQ adalah data acquisition yang akan dipakai untuk menghubungkan hardware dengan komputer dan fungsi-fungsi pengukuran elektronik. Untuk masa yang akan datang, sistem ini boleh diaplikasikan di bilik kuliah, rumah pejabat dan sebagainya.

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LIST OF ABBREVIATION

LabVIEW	- Laboratory Virtual Instrumentation Engineering Workbench
DAQ	- Data Acquisition
NI	- National Instrument
AC	- Alternating Current
GSM	- Global System for Mobile
RFID	- Radio Frequency Identification
ADC	- Analog-To-Digital Converter
SMS	- Short Message Service
PIR	- Passive Infrared Sensor
LED	- Light-emitting Diode
IR	- Infra-Red

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CHAPTER 1

INTRODUCTION

This chapter will give reader a basic introduction of how the idea of the project generated. In this chapter will show the introduction, objectives, problems statement, scopes of work, methodology, and simple brief for the report structure.

1.1 Background

From the previous project, we can know that there are no people (student or lecturer) who concern to switch off supply after the lecture session was finished. The supply always be forgotten to be switch off while there have no student in the classroom. The supply will always turned off by the BPA staff in the evening. This smart switching system will used to control the power supply by using sensor or follow the preset time schedule in order to reduce energy waste.

The Smart Classroom Using LabVIEW that was designed by senior is by using schedule and SMS to switch on and off the electrical power system. It is a very good designed for saving the electricity but still have weakness. The weakness of the project that done by senior is when lecturer forgets to change the time table when they postpone or cancel the class, the power system will still on, hence it will cause the wasting of

energy and money. Besides that, when the lecturer wants to use the lecture room need to arrange the time table switch on the power system.

The new Smart Classroom Using LabVIEW is easier to use. By using a sensor and LabVIEW software, we can switch the power system by using SMS or sensor. When sensor detect there has a person, the power system will switch on and it will turn off when the sensor sense no body at there. Besides that we can also switch on and off the power system by using SMS.

This project presents the design of a smart switching system for classroom advanced with using sensor for the object detection. First of all, the LabVIEW software is used to create a front panel of virtual instrument. The front panel will let user to choose whether they want to use sensor or schedule mode. When schedule mode had been choose, the system will read the time and switch the power supply follow the schedule. When the sensor mode had been choosing, the sensor will start to read the appearance of students and lecturers, if it detect appearance, it will send signal to DAQ and switch the power supply, else it will remain off.

Finally, the Smart Classroom Using LabVIEW project will let us have more convenient and save our energy, money and of course our environment.

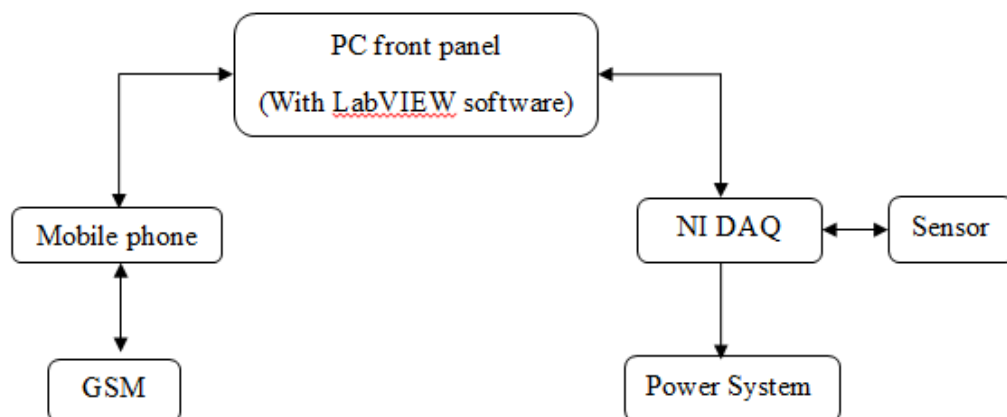


Figure 1.1 System Block Diagram

1.2 Objectives

The main objective of this project is to upgrade the smart switching system and by adding a sensor circuit in to it. Hence there have many objectives that need to be achieving for this project.

- i. To design an alternative control by using SMS application to communicate the PC thus the power loads can be turn on or off manually.
- ii. To design the hardware as interface between software and hardware by using GSM modem, NI DAQ, and others electronic components.
- iii. To study and understand the basic concepts of the LabVIEW software.
- iv. To monitor the status of power loads through the front panel and provided SMS notification with any system operation failure.
- v. To save the usage of electricity by through efficiency control system and low power dissipation load.
- vi. To design a sensor switching system provide automatic switch on/off via PC.

1.3 Problem Statement

Currently, previous project is research on the waste of energy that done by the students and lecturers. The previous project give a good start in researching the ways to help our university to reduce the energy and cost wasting. The previous project reduces the waste of energy by using time table arrangement. But the problem is when the lecturer wants to use the lecture room need to arrange the time table to switch on the power system. But if we install just one more sensor circuit to the power system, it would be easier for our lecturer to turn on the power system with just go in to the lecture room. When the class postpone or cancel, but the lecturer for get to change their time table, it will cause a small energy waste while we are not using the power system but it still switched on. Hence, “Smart Classroom Using LabVIEW” is another better solution for overcome energy wasting problem.

1.4 Scopes Of Work

This project covered few parts, which are:

- i. Study of LabVIEW software programming language.
- ii. Study and understand the LabVIEW block diagram of previous project.
- iii. The study of NI DAQ 6009 which used for interfacing between hardware and software.
- iv. The Prototype development to perform the system operation.

All the scopes above function in a system to control the power system.

1.5 Project Significant

There have few problems that we will face during the development of this project:

- i. Overcome the problem of interfacing between LabVIEW software and GSM modem.
- ii. Redesign the program of previous project and include the sensor circuit into it.
- iii. Will be able to shut on and off the supply by sensor detecting.
- iv. Interfacing between the sensor with the DAQ device.

1.6 Project Methodology

To make sure can have a successful outcome in the project, the objectives must be achieved. From the starting of this project is having discussion with supervisor about the basic concepts of the project. The methodology of the PSM 2 can divide into 2 groups, first part is hardware part design such as sensor circuit and connection between

sensor and DAQ. Second part is software design such as LabVIEW front panel and block diagram design. For literature review stage, the research had been done on the sensors comparison, comparison between the Programming, designing the sensor circuit, research on senior's project and so on. For hardware part, construct the sensor circuit and interfacing the sensor with the DAQ, study how to solve over current and system overall testing. If the output meets the requirement and specifications, the project can consider as success. If the output did not fulfill the requirement and specifications, so troubleshooting and seeking information is need for redesign the overall project. For more details, will be explained and discussed in project methodology which is Chapter III.

1.7 Report Structure

This report is documentary delivering the ideas generated, concepts applied, activities done, and finally the product of project itself. It consists of five chapters. Following is a chapter-by-chapter description of information in this report.

- Chapter I : Introduction

This first chapter is more on the general overview of the project. In this chapter, the background of the problem and the emergence of the project are stated first. Besides, the project objectives, scope of project and the methods used are also included.

- Chapter II : Literature Review

This second chapter discusses the background of study related to the project. This chapter consists of the evidence with the broad (e.g. books, internet, lecture notes etc) and focus (previous PSM, thesis, journal papers etc) areas of the study. In this chapter, the trend, direction and research issues are also identified. It can be said that this chapter is more on the evidence of not repeating what others have done.

- Chapter III : Project Methodology

In project methodology, the materials, subjects, and equipment or apparatus used are identified. Besides, the methods or procedures during the project implementation are also stated. Insufficient, the justification for choosing the method or approach is also stated.

- Chapter IV : Results and Discussion

In this chapter, the observation and result obtained from the data analysis are presented. Then, the project discovery is arranged tidily using the aid of figures and tables. Besides, the result or discovery is explained and compared with previous studies. Then, the result from the comparison is discussed.

- References & Appendices

Listed all the sources cited list of sources cited (referred to). Maps, charts, tables, lists, diagrams, or other explanatory sections regarding to the project.

CHAPTER II

LITERATURE REVIEW

This chapter will discuss about the literature discourse and the review of smart switching system. This chapter is regarding the background study of the project to perform and documented about the theoretical concept applied in completing the project. It included SMS, LabVIEW, DAQ and so on. Then is the reason of choosing the specific software and hardware.

2.1 Introduction

Nowadays, the world looks to sensors to play a bigger role in the control systems. Sensors are already an accepted platform for system supervisory control. The well-function of the sensor and the easy-to-use for switching system make it work more efficiency. In this project, sensor circuit and National Instrument LabVIEW software is implemented to reduce the waste of energy and provide more effective management system in FKEKK.

Literature reviews are based in information obtained from valid sources such as books, articles of relevance, published paper or any other source deemed appropriate. For the PSM 2, mostly study on the designing of the sensors, the rectifiers and the

circuits, advantages of the LabVIEW software, Infrared Sensor, the energy saving by the sensor and so on. The study is needed for solving the problems that's we face to.

2.2 LabVIEW

LabVIEW (short for Laboratory Virtual Instrumentation Engineering Workbench) is a platform and development environment for a visual programming language from National Instruments. The purpose of such programming is automating the usage of processing and measuring equipment in any laboratory setup. The graphical language is named "G" (not to be confused with G-code). Originally released for the Apple Macintosh in 1986, LabVIEW is commonly used for data acquisition, instrument control, and industrial automation on a variety of platforms including Microsoft Windows, various versions of UNIX, Linux, and Mac OS X.

2.2.1 LabVIEW Programming

In this project, LabVIEW has been used as the main platform. LabVIEW is a modern graphical programming language that has been widely adopted throughout industry, academia, and government lab as the standard for data acquisition, instrument control software, and analysis software [1]. LabVIEW is not a panacea; for simple tasks it is unsurpassed, but, like any programming language, programming complicated applications is difficult. While LabVIEW does not resemble other languages, many of the programming guidelines you may have learned previously still apply: breaking functionality down into subroutines, testing subroutines individually, avoiding side effects like global variables, paying attention to memory management, and using efficient data structures are always worthwhile.

LabVIEW is a program development application, much like various commercial C or BASIC development systems. However, LabVIEW is different to those