ELECTRICAL POWER SUPPLY FAILURE INFORMATION SYSTEM

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ELECTRICAL POWER SUPPLY FAILURE INFORMATION SYSTEM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Electrical Engineering Technology (Industrial Power) (Hons.)

by

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DECLARATION

I hereby, declared this report entitled "Electrical Power Supply Failure Information System" is the results of my own research except as cited in references.

Signature   :   ………………………………………

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Date   :   24 December 2014

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor's Degree in Electrical Engineering Technology (Industrial Power). The member of the supervisory is as follow:

…………………………………

(Project Supervisor)

ABSTRAK

Projek ini mencadangkan untuk membangunkan Sistem Maklumat Kegagalan Bekalan Kuasa Elektrik menggunakan modem Sistem Global Komunikasi Mudah Alih (GSM). Sistem ini adalah satu sistem yang mudah untuk mendapatkan maklumat bekalan elektrik terputus di rumah atau bangunan apabila tidak mempunyai bekalan elektrik. Ia direka selari dengan matlamat iaitu untuk membina sebuah Sistem Maklumat Kegagalan Bekalan Kuasa Elektrik yang dilengkapi dengan modem GSM. Selain itu, matlamat projek ini adalah untuk membangunkan sebuah modul GSM yang digabungkan dengan pengawal PIC untuk sistem ini. Ia juga untuk menganalisis prestasi sistem ini melalui SMS. Projek ini juga termasuklah untuk mengkaji mengenai modul GSM, pengawal PIC dan juga mereka bentuk litar dengan menggunakan perisian Proteus dan simulasi. Projek ini juga diuji sebelum melakukan pengujian pada model sebenar. Kelebihan komunikasi selular seperti teknologi GSM adalah satu penyelesaian yang berpotensi menjadi alat kawalan jauh. Selain itu, fungsi sistem ini berupaya untuk menghidupkan bekalan utama dengan menggunakan SMS melalui telefon bimbit. Oleh itu, maklumat bekalan elektrik terputus akan dihantar ke telefon bimbit berkenaan status elektrik terkini. Selain itu, rangkaian GSM juga boleh memberikan maklumat terkini atau masa yang ditetapkan setiap 8 jam sehari. Sistem ini telah digabungkan dengan pengawal PIC dan rangkaian GSM untuk menghidupkan kembali elektrik semasa.

ABSTRACT

This project proposes the development of Electrical Power Supply Failure Information System using Global System for Mobile Communications (GSM) modem. This system is a tool assist obtain easy information blackout at house or building when not have electricity. It is designed related with objective are to design an Electrical Power Supply Failure Information System equipped GSM capability and to develop a GSM module integrate with PIC Microcontroller for the system. Its to analyze the performance this system via SMS. This project includes studying about GSM module, PIC Microcontroller and also designing the circuit by using Proteus software and simulation. This project also is supposed to test before testing at real model. The advantages of cellular communications like GSM technology is a potential solution such as remote controlling switch. Another function of the system is capable to switch on the main supply by using SMS through mobile phone. Thus, the information blackout sends to cellular phone about status electric current from circuit system. Besides that, GSM network can give information date or regular time at 8 hour per day. The system was integrated with microcontroller and GSM network to control main switch to switch on current electric.

DEDICATION

Specially dedicated to my family

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ARFCN	=	Absolute Radio-Frequency Channel Number
ASCII	=	American Standard Code for Information Interchange
AT	=	Attention
ATA	=	Actual Time of Arrival
ATD	=	Actual Time of Departure
ATH	=	Audio-Technica
ATO	=	Auto Top Of System
BSC	=	Base Station Controller
BTS	=	Base Transistor Station
CDMA	=	Code Division Multiple Access
CMOS	=	Complementary Metal Oxide Semiconductor
EEPROM	=	Electrically Erasable Programmable Read Only Memory
EPROM	=	Erasable Programmable Read Only Memory
ETSI	=	European Telecommunications Standards Institute
GPP	=	Generation Partnership Project
GPRS	=	General Packet Radio Service
GSM EDGE	=	Enhanced Data rates for GSM Evolution
GSM	=	Global System for Mobile Communication
HLR	=	Home Location Register
IC	=	Integrated Circuit
ISIS	=	Intelligent Schematic Input System
ITU-T	=	Telecommunication Standardization Sector
JAL	=	Just Another Language
LCD	=	Liquid Crystal Display
LED	=	Light Emitting Diode
MAP	=	Mean Arterial Pressure
MCU	=	Microcontroller Unit

MCCB	=	Miniature Case Circuit Breaker
MS	=	Mobile Station
MSC	=	Mobile Switching Centre
PC	=	Personal Computer
PCB	=	Printed Circuit Board
PDU	=	Protocol Data Unit
PIC	=	Peripheral Interface Controller
POTS	=	Plain Old Telephone Service
PROM	=	Programmable Read Only Memory
PSTN	=	Public Switched Telephone Network
PWM	=	Pulse Width Modulation
RAM	=	Random Access Memory
RCCB	=	Residual Current Circuit Breaker
SIM	=	Subscriber Identity Module
SMS	=	Short Message Service
SMSC	=	Short Message Service Centre
SPI	=	Serial Peripheral Interface
SS7	=	Signalling System No.7
UCS	=	Universal Character Set
UART	=	Universal Asynchronous Receiver/Transmitter
USART	=	Universal Synchronous/Asynchronous Receiver/Transmitter
3GPP	=	Third Generation Partnership Project

CHAPTER 1
INTRODUCTION

This chapter will discusses briefly the overview of this project such as introduction, objectives, problem statement, and scope of work, methodology and thesis outlines.

1.1 Background

This project proposes the development of an information system failure of electrical power supply using Global System for Mobile Communications (GSM) Network. This system helps mobile device information blackout in the building when not have electric. This project will be able to turn back the main power supply when the power supply is disconnected. Electrical Power Supply Failure Information System typically has many more complicated systems, but they all operate via the same principles.

Electrical Power Supply Failure Information System works via fairly simple system PIC Microcontroller and SMS. Normal building devices such as lamps, motor systems, heaters, air conditioners, computers, security system and radio are equipped with receivers. This PIC Microcontroller detects a certain signal initiated by the code SMS, which can be housed in a control device such as light switch or most commonly a main switch.

In order to design the smart home system in this project, this system can control by using Short Message Service (SMS). Nowadays, SMS is widely used as a

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form of data communication. It is about 2.4 billion active users which to equals to 74% of mobile phone subscribers sending and receiving text messages on their phones. SMS is a communication application in Global System for Mobile communication (GSM) system. It allows interchange of short text message between mobile telephone devices using standardized communication protocols.

The system in this project is design to receive the SMS from any mobile device to the GSM modem that connected to microcontroller. In order to prevent any occurrence of SMS likelihood control words, the sending SMS that contain control words should come between the specified codes that protocol between user of far mobile phone and the GSM modem that connected to the microcontroller. After the GSM modem which connected to the microcontroller receives the sent message, it sends this message to the microcontroller.

1.2   Problem Statement

The situation prevailing today always calls for people and property to be completely secure. In early days security was not of this concern. Advancement in every field and all walks of life has rendered the world with more of malpractice committed by a sect of people who are socially not unacceptable. Nowadays in organizations an industries, other than conventional means of security electronic security systems are a common feature. Sometimes, the management not knows about blackout at building in its sector because there's not always at his office. They will worry about the appliances at building when the electric current are switch off necessarily. The devices provide a foolproof system from which everyone can feel highly secured.

The development of digital information has led the rapid change in human lifestyle. The use of electricity is very important as one of the main source of energy that is vital in today modern life. However, the problem arise how to give supply come back if have anything blackout and to get faster troubleshoot that for to save many appliance in building. Thus a prototype based on a microcontroller device using SMS and GSM modem is developed.

1.3 Objective of Project

(i) To design an Electrical Power Supply Failure Information System equipped GSM capability.

(ii) To develop a GSM module integrate with PIC Microcontroller for the system.

(iii) To analyzes the performance this system via SMS.

1.4 Scope of Project

There are a few scopes and guidelines listed to unsure the project is conducted within its intended boundary. This is to ensure the project is heading in the right direction to achieve its intended objectives.

(i) Study information the GSM network via SMS only.

(ii) Deal with connection I/O of GSM.

(iii) Test run & troubleshoot the program.

(iv) Link the hardware and the software.

1.5 Methodology

Stage 1: Do literature review for the project system by study the characteristic of the components that will be used and understand the operation of the circuit.

Stage 2: The next process is to plan how the project or problem formulated be organized and possible solution are arranged systematically.

Stage 3: The project is then divided into two parts; hardware design and software design. The Proteus software has been chosen in the circuit design, while the PICkit 2 is to program the PIC using assembly language.

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Stage 4: The final circuit design then finally be printed on the PCB and unit test is performed to ensure its error free then final testing to indicate the integration is free from error. Troubleshooting activity executes if error is encountered.

1.6   Thesis Outlines

This thesis consists of five chapters. The following chapters are the outline of the implementation of Electrical Power Supply Failure Information System.

Chapter I: This chapter will discusses briefly the overview of this project such as introduction, objectives, problem statement, and scope of work, methodology and thesis outlines.

Chapter II: This chapter contains the research and information about the project on several important concepts of Electrical Power Supply Failure Information System, technology and tools used in the study. This chapter also includes details in software and hardware design for Electrical Power Supply Failure Information System. Background of GSM modem and several types of smart home that consist in our building also are discussed in this chapter.

Chapter III: This chapter will discuss more about methodology used in order to solve the project problem. All those methodology should be followed to get a better performance.

Chapter IV: This chapter will discuss result and analysis detailed on designing electrical power supply failure information system of the model. Hardware and Software result will be discussed in this chapter. All construction circuit, analysis, observations and design are represented in this chapter. The results presented in this thesis are based on the design procedure that has been stated before.

Chapter V: This chapter will discuss about the discussion, problem, conclusion and suggestion of this project. Any comment or suggestion can be attached in order to improve the project in the future.

CHAPTER 2
LITERATURE REVIEW

This chapter contains research and information on the project to several important concepts in information systems failure of electrical power supply, technology and materials to be used in this study. In this chapter also includes the description of software and hardware in detail for the electrical power supply.

2.1   Introduction Literature Review

This section provides a previous study of related work regarding the application of SMS services in a various fields. Some previous researches have been studied to gain more information about current existing GSM control system that was previously implemented. It is necessary to know and understand how the software and hardware were used in the SMS controlled system development. This is to ensure that the study that currently being conducted contribute at certain level of application thus it become more efficient and practical.

2.2 Related Work

2.2.1 Home Security with Messaging System, Security & Control System and Remote and Security Control via SMS

Some smart home projects such as Home Security with Messaging System (Shahir 2008).Security & Control System, and Remote and Security Control via SMS (Lock 2004). The house protection of notifies a thing happened around the home such as theft or wildfire that received by SMS. Microcontroller PIC16F877A circuit which interfaced by the PC combines to use cellular phone of safety system. The sensor switched when strange activity source the system working consequently the PIC circuit make active PC automatically to send info SMS to the modem cellular phone consumer.

2.2.2 Automatic Power Meter Reading System using GSM Network

Meantime, the system Automatic Power Meter Reading System using GSM Network according Roodney Tan, Lee & Mok (2007) is automating the power reading meter to send the energy consumed to e-billing system at authorized office. The system works by integrating the GSM modem that was embedded with digital kWh power meter. It utilizes the GSM network to send power usage reading using SMS to the authorized office. The authorized office collect and manage the received SMS message contains the meter reading to generate the billing cost and send back the cost to the respective consumer through SMS.

2.2.3 Integrated Billing System through GSM Network

Integrated Billing System through GSM Network writes by Helmy, Siti Zarina & Fazliza (2007) is about the development of Integrated Water Billing

System with SMS capability. The system is designed to facilitate the water authorized to manage the monthly billing system without the use of human services. The system receives SMS from the meter to central databases. Then the information received is processed to generate current billing. The system again sends a SMS notification to the user regarding the total amount that has been billed. The system was implemented using Visual Basic and database in order to perform the prototype and the system works successfully in sending SMS to user for notification.

2.2.4 Remote and Security Control via SMS

Furthermore, Remote and Security Control System via SMS indicated by Lock (2004) is to control the switch for lamp, door and alarm system using Visual Basic 6.0 software. Visual Basic was chosen because it can easily communicate between computer and mobile phone. The system used computer and mobile phone to send and receive the text messages.

2.2.5 Vehicle Speed Detection using SMS

Vehicle Speed Detection using SMS by Elia Nadira and etc (2008) presented the design of the black box for warning system to control the exceeding speed of express bus via SMS. The system consists of three main parts which is microcontroller circuit, relay driving circuit and also mobile phone. This project used PIC 16F877A, Nokia 3310 mobile phone and using JAL (Just Another Language) software for the programming. The purpose of this project is to prevent the express bus driver from driving over the permitted speed limit as well as to educate the drive to obey the regulation; therefore the accident can be prevented as well. The system is activated when the speedometer in the black box exceeds the speed limit permitted by Department of Transportation, thus, SMS text notification is sent to JPJ for record.

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2.2.6 Acquiring Water Level and Temperature Status via SMS

Moreover, the project for Acquiring Water Level and Temperature Status via SMS indicated by Mohd Noor (2008) also has similarity with this project. This project utilized PIC 16F877 and MPLab IDE software for programming. The project was designed to detect level and temperature of the water in a pool. The system functions when the level of water and the temperature in pool exceed the desired limits. At the same time the PIC circuit will automatically interface to the mobile phone and send the alert message to the user.

2.2.7 SMS Remote Control, For Ericsson T10 GSM Mobile Phone

A very similar project also has been implemented as indicated by Serasidis Vasilis in their report *SMS Remote Control, For Ericsson T10 GSM Mobile Phone* (2003), who has developed and designed a device that can control variety of electrical home appliance using SMS. The system works based on the order message from user through mobile phone which is ON or OFF. This system also utilized mobile phone as a receiver which connected to the microcontroller.

2.3 GSM Modem

2.3.1 What is GSM?

GSM is a Global System for Mobile Communications. GSM is an international digital cellular telecommunication. It is a second generation cellular standard developed to cater voice service and data delivery using digital modulation. The GSM standard was released by ETSI (European Telecommunication Standard Institute) back in 1989. GSM network is a cellular telecommunication network with a versatile architecture complying with the ETSI GSM 900/GSM 1800 standard.