UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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GSM SURROUNDING HOME AREA INTRUDERS SECURITY

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

by

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TAJUK: **GSM SURROUNDING HOME AREA INTRUDERS SECURITY**

SESI PENGAJIAN: **2015/16 Semester 1**

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I hereby, declared this report entitled "GSM Surrounding Home Area Intruders

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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 of Engineering Technology (Industrial Electronic) (Hons.). The member of the supervisory is as follow:

………………………………….

(Project Supervisor)

ABSTRACT

The final year project aims at exposing the students undergoing higher technical studies to the thoughts and logic that must be developed to ensure that one is able to integrate his/her ideas into something useful. This generally is initiated by the inception of an idea or a concept, which not only aims at developing a product (Hardware of Software), but also the in-depth study of the earlier existing products in the same category and their deficiencies. Accordingly an approach is taken to propose a solution, which is better from the previous ones in one respect or the other. With the same approach in mind, I, the final year student of Bachelor of Engineering Technology Electronic (Electronic Industry), have taken up the GSM Surrounding Home Area Intruders Security as my final year project. These systems are a useful addition to today's home where safety is an important issue. This project provides security to the house owner from any intruders or any form of robbery by automatically activating the alarm, house light, and also send SMS to the phone of house owner. Through all these units, it can immediately advise house owners that the house area has illegally trespassed by the intruders.

ABSTRAK

Projek tahun akhir bertujuan mendedahkan pelajar menjalani kajian teknikal yang lebih tinggi kepada pemikiran dan logik yang perlu dibangunkan untuk memastikan sesuatu yang dapat mengintegrasikan idea menjadi sesuatu yang berguna. Ini biasanya dimulakan oleh permulaan idea atau konsep, yang bukan sahaja bertujuan untuk membangunkan produk (Perisian Hardware), tetapi juga kajian yang mendalam tentang produk sebelum ini yang sedia ada dalam kategori yang sama dan kekurangan mereka. Oleh itu pendekatan yang diambil untuk mencadangkan penyelesaian, yang lebih baik dari yang sebelumnya dari satu segi atau yang lain. Dengan pendekatan yang sama dalam fikiran, saya, pelajar tahun akhir Sarjana Muda Teknologi Kejuruteraan Elektronik (Elektronik Industri), telah mengambil "GSM Surrounding Home Area Intruders Security" sebagai projek tahun akhir saya. Sistem ini adalah sesuatu yang berguna untuk rumah hari ini di mana keselamatan adalah isu yang penting. Projek ini menyediakan keselamatan kepada pemilik rumah daripada mana-mana penceroboh atau sebarang bentuk rompakan dengan secara automatik mengaktifkan penggera, lampu rumah, dan juga menghantar SMS ke telefon pemilik rumah. Melalui semua unit-unit ini, ia segera boleh memberitahu pemilik rumah bahawa kawasan rumah itu telah dimasuki oleh penceroboh.

DEDICATIONS

I would like to dedicate this project to my supervisor, Mr. Tengku Mohd Faisal Bin Tengku Wook that assists me develop this project. I also want to thanks to my family members, lectures and friends that help me in developing this project.

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LIST OF SYMBOLS AND ABBREVIATIONS

SMS	=	Short Message Service
GSM	=	Global System for Mobile
PIR	=	Passive Infrared
LCD	=	Liquid Crystal Display
LED	=	Light Emitted Diode
ISA	=	Instruction Set Architecture
RAM	=	Random Access Memory
PCB	=	Printed Circuit Board
NO	=	Normally-Open
NC	=	Normally-Closed
SPST	=	Single Pole Single Throw
DPDT	=	Double Pole Double Throw
IDE	=	Integrated Development Environment
V	=	Voltage
A	=	Ampere
Cm	=	Centimetre
m	=	Metre
mm	=	Milimetre

CHAPTER 1

INTRODUCTION

1.0 Introduction

In today's age of digital technology and intelligent system, home security has become one of the fastest developing application-based technologies in the world. The idea of comfortable living in home has since changed for the past decade as digital, vision and wireless technologies are integrated into it. Intelligent homes, in simple terms, can be described as homes that are fully automated in terms of carrying out a predetermined task, providing feedback to the users, and responding accordingly to situations. In other words, it simply allows many aspects of the home system such as temperature and lightning control, network and communications, entertainment system, emergency response and security monitoring systems plays an important role of providing an extra layer of security through user authentication to prevent break-ins at entry points and also to track illegal intrusions or unsolicited activities within the vicinity of the home (indoors and outdoors).

There has been much research done in the design of various types of security systems. Many security systems are based on only a single system. In an event of system failure or intrusion of the user authentication, there is no backup system to monitor the home continually. This shortcoming can dealt with using multiple security system. However, multi-system implementations will definitely be more demanding in terms of computational cost and organization. This requires care integration and sharing of resources. Thus, a feasible system should be effective, practical and reasonable in cost. In this paper, I proposed an integrated dual-level sensor surrounding home security system, consisting of two sub systems an IR sensor, burglar

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alarm module and home light module. Both subsystems works independently but are incorporated into single system for practical implementation. [2]

1.1   Background

The project here is all about a Home security system with combination of Global System for Mobile communication (GSM) Modem. In this project I have planned to develop a home security system for detecting an intrusion into monitored area by a motion sensor. A security system has a flee-standing intrusion detector. The sensor will act as the input of the system which detecting an intrusion that try to climb on top of the wall surrounding home area. Once the intrusion detector is activated, the signal is transmitted to the microcontroller and the signal being sent to GSM module that will send SMS to house owner. There are others system layer that also act as the backup system which are burglar alarm and light of the entire house. The signal continuously transmitted until intrusion detector has been reset.

This system not just can be used in home environment but it also can be practically used in a business environment too. This security system can be said as friendly and multiple used because it can monitor the surround to not only protect our properties but also our lives. Certain security systems can be set to literally cover all floors and doors inside and outside of the home.

1.2   Problem statement of project

The conventional way that is often been used by home owner us users always worried about their home especially while they are not at home. The problems which often occurred due to this method are:

i.   The number of stolen increase in our country because lack the control and attention by owner.

ii.   Many cases of burglary start climbing the outer wall of the house

1.3 Objective of Project

The main objective of this project is to design and develop a security system for house owner that is capable of monitoring any intruders and other emergency situation by alarming the house owners by sending the SMS. The objective can be summarized as below:

   i.   To build house alert system from the intruders.

   ii.   To design the low cost prototype of house alert system.

   iii.   To study the capable of last long this system.

1.4 Scopes

This project concentrates on a development of a motion sensor for house security system. To develop the whole project, it consists of three methods which are the concept of security system, the electrical structure, and the software programming. The concept of security system is on the detection of movement on top of the surrounding house wall using active sensor to trigger alarm and send signal to owner that control by the software programming.

CHAPTER 2
LITERATURE REVIEW

2.0   Introduction

This chapter discusses about the literature discourse and review of structural analysis and some definition of the components used in this project such as GSM Module, ultrasonic sensor, microcontroller and etc. Through the world, there have many difference sources and researches about the concept, design and implementation of the GSM and ultrasonic sensor using microcontroller. It also included the investigation of what others have done in this area. This study included the areas of electric, electronic and software development. Literature reviews are based on information that obtained from various sources, articles, technical reports, general reports, websites, books and personal communication.

2.1   Synopsis of Journal

In this part, it involve in finding information about fundamental related to this project. This includes materials such as text books, journal, manual, websites and catalogues. The table 2.1 below has shown the summary of journal:

Table 2.1 Summary of Journal

NO	JOURNAL TITLE	AUTHOR
1	GSM Based Intelligent Home Security System for Intrusion Detection	Eseosa and Promise, 2014
2	Smart Home Security System Using Microcontroller	Ruhilyati Mahamad 2010

3	GSM Interfacing Board	Campus Component Pvt. 2011
4	PIR Motion Sensor	Micko 2009

2.1.1 GSM Based Intelligent Home Security System for Intrusion Detection

This project developed by (Eseosa & Promise 2014) from Port Harcourt, Nigeria. Conventional security systems which are the commonest form of protection to lives and properties, have certain limitations such as real time monitoring and control of activities such as intruders in the form of human beings, fire, smoke, etc. These limitations in most cases result in high financial loss to properties and lives. This work involves design and construction of GSM intelligent home security system for real time monitoring of intruders. It consist of intrusion detection sensors, (pressure, Smoke/Fire, Gas and PIR motion), wireless sensors, programmable microcontroller in embedded C language, regulated power supply unit, proteus (circuit simulator), relays, GSM modem, mobile phone, data acquisition node and an interface program development. The design calculation and analysis was carried out before it was modeled, simulated in proteus electronic simulator environment. When the PIR finds intruders (in form of variation in temperature, gas leakage, pressure, etc), the relevant sensing device(s) respond and the microcontroller sends encoded alarm signal to the wireless sensor network established in home. The moment the alarm signal is received, it will send alarm short message to the users (owners of the building) through GSM network immediately. The design analysis and calculations were carried out and finally, a positive result was achieved. In certain case, GSM can contribute to society that lead to the advance of technologies.

2.1.2 Smart Home Security System Using Microcontroller

This project was develop by (Ruhilyati Mahamad 2010) from Malaysia. This project focuses on the programming of microcontroller using high level language. The PIC family of microcontrollers is chosen as the target microcontroller because of the low power consumption which made this microcontroller popular in portable application. This project entitles Security System provides security to the house owner from any intruders or any form of robbery by automatically activating the alarm and emergency light and alsodisplay the situation by LCD connected to the microcontroller device. Through an alarm and emergency light microcontroller unit can immediately advise house owners that the house is being robbed or an intruders has illegally trespassed their respective home.

2.1.3 GSM Interfacing Board

Based from the journal of (Campus Component Pvt. 2011), GSM (Global System for Mobile) / GPRS (General Packet Radio Service) TTL – Modem is SIM900 Quad-band GSM / GPRS device, works on frequencies 850 MHZ, 900 MHZ, 1800 MHZ and 1900 MHZ. It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3 and 5V DC TTL interfacing circuitry, which allows User to directly interface with 5V Microcontrollers (PIC, AVR, Arduino, 8051, etc.) as well as 3V3 Microcontrollers (ARM, ARM Cortex XX, etc.). The baud rate can be configurable from 9600-115200 bps through AT (Attention) commands. This GSM/GPRS TTL Modem has internal TCP/IP stack to enable User to connect with internet through GPRS feature. It is suitable for SMS as well as DATA transfer application in mobile phone to mobile phone interface. The modem can be interfaced with a Microcontroller using USART (Universal Synchronous Asynchronous Receiver and Transmitter) feature (serial communication).

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2.1.4 PIR Motion Sensor

Based from the journal of (Micko 2009), PIRs are basically made of a pyroelectric sensor (which you can see above as the round metal can with a rectangular crystal in the centre), which can detect levels of infrared radiation. PIR sensors are more complicated than many of the other sensors explained in these tutorials (like photocells, FSRs and tilt switches) because there are multiple variables that affect the sensors input and output. To begin explaining how a basic sensor works, we'll use this rather nice diagram (if anyone knows where it originates plz let me know). The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor. It causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.

2.2 Definition of Component

This project is divided into few parts that consist of microcontroller, motion sensor, GSM module, alarm and light. The division is for easy development. Before all parts of components are being connected together, it going to be test first and make sure it work independently. In this chapter will discuss about each component that will be used which is consist of hardware and software part. Below is the overview of components used

- PIC16F877A

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- Ultrasonic Sensor

- GSM Modem 900A

2.2.1 PIC16F877A

PIC 16F877 is one of the most advanced microcontroller from Microchip. This controller is widely used for develop projects and modern applications because of its low price, wide range of applications, high quality, and easy to programmed. It is ideal for applications such as machine control applications, measurement devices, study purpose, and so on. The PIC 16F877A features all the components which modern microcontrollers normally have. The figure of a PIC16F877A chip is shown below.

Figure 2.1 PIC16F877A

2.2.1.1 Memory Organization of PIC16F877A

The memory of a PIC 16F877 chip is divided into 3 sections. They are program memory, data memory and data EEPROM. The explanation about one of the section is program memory which are contains the programs that are written by the user. The program counter (PC) executes these stored commands one by one. Usually PIC16F877 devices have a 13 bit wide program counter that is capable of addressing 8K×14 bit program memory space. This memory is primarily used for storing the programs that are written (burned) to be

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used by the PIC. These devices also have 8K*14 bits of flash memory that can be electrically erasable /reprogrammed. Each time when write a new program to the controller, it must delete the old one at that time.

2.2.1.2   Comparison of PIC16F877A and PIC18F4550

Table 2.2 Comparison of PIC16 and PIC18 Family

PIC16F877A	PIC18F4550
The 16F877A is a capable microcontroller that can do many tasks because it has a large enough programming memory (large in terms of sensor and control projects) 8k words and 368 Bytes of RAM.	PIC18F4550 has 16 bit Instruction Set Architecture, (ISA) which provides a degree of freedom to programmers with various data types , registers , instructions, memory architecture, addressing modes, interrupt and IO operations

2.2.2   Ultrasonic Sensor HC-SR04

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats or dolphins do. Bat will release the echo to detect the other predators. It offers excellent range accuracy and stable readings which are easy to use. It operation is not affected by sunlight or black material like Sharp rangefinders which are soft materials like cloth can be difficult to detect. Similar in performance to the SRF005 but with the low-price of a Sharp infrared sensor. Below are the description of power supply, current, angle and also the range of sensing.

- Power Supply :5V DC