MOTION DETECTION SYSTEM WITH COMMUNICATION CAPABILITY

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

Faculty of Electronic Engineering and Computer Engineering
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Special dedication to my beloved parents

Mohd Ab Rahman Bin Harun & Latifah Bt. Othman

Their encouragement and guidance has always be an inspiration to me along this journey of education.

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ABSTRACT

The purpose of this project is to develop an independent security system that able perform direct contact with the owner, even though the owner is at different location either on vacation or outstation. This requirement has become a demanded as nowadays systems are too dependent to the community. Although the system is in 'on' condition, some communities are not alert to this situation. These communities are not to be blame because false alarms are too often occurs. Different with an ordinary system, this project will be able to call its owner when an unwanted visitor enters the range of the sensor. Even though this system is based on range, it has been modified to detect only human body. So there is no possibility that the system will be triggered 'on' by an animal. If the system has been triggered, it will call the preprogrammed telephone number three times. If the owner of the preprogrammed telephone number receives the calls, they will hear the calling tone and will notify that they were called by their security system. This system able to save two numbers and the system can be set either to dial both number in series or just one number in a time. The system will call the second number, if only the first number cannot be reached. The main objective of this project is to develop a security system with communication capability which involves the movement detection system with the telephone dialer system therefore, this system will be independent and a reliable device compared to common system.

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ABSTRAK

Tujuan utama projek ini adalah untuk membangunkan satu sistem keselamatan yang berkeupayaan untuk berkomunikasi secara terus dengan empunya kediaman walaupun berada jauh dari unit kediaman masing-masing samada bertugas di luar kawasan mahupun sedang bercuti. Kebolehan ini telah menjadi satu keperluan yang penting dimana system yang terdapat di pasaran kini terlalu bergantung kepada komuniti sesebuah kawasan. Ini dapat dilihat dimana apabila system sekuriti yang ada berfungsi, sesetengah komuniti tidak mengambil berat akan keadaan ini. Ini disebabkan kerana kekerapan berlakunya situasi yang diistilahkan sebagai 'amaran palsu'. Berlainan dengan projek ini, dimana hasil projek ini akan berkeupayaan untuk berhubung dan memberi amaran kepada empunya rumah sekiranya tetamu yang tidak diundang memasuki kawasan yang dapat dicapai oleh pengesan. Walaupun sistem ini berdasarkan kepada applikasi pengesan sesuatu kawasan, pengesan ini telah di ubahsuai supaya hanya mengesan kehadiran manusia. Oleh itu, kebarangkalian sistem ini di aktifkan oleh haiwan amat kecil dan berkemungkinan tidak akan berlaku. Apabila sistem ini diaktifkan, sistem ini akan mendail nombor yang telah diprogramkan sebanyak tiga kali dan apabila orang yang dihubungi menerima panggilan, mereka akan mendengar nada dail dan akan sedar bahawa mereka sedang dihubungi oleh sistem sekuriti rumah mereka. Sistem ini berupaya menyimpan dua nombor telefon pada satu-satu masa. Sistem ini boleh ditentukan samada mendail kedua-dua nombor secara siri ataupun akan mendail satu nombor utama dan hanya mendail nombor kedua sekiranya nombor utama tidak dapat dihubungi. Applikasi ini akan memenuhi objektif utama projek ini iaitu untuk mencapai operasi sistem sekuriti yang berkebolehan untuk berkomunikasi dan membangunkan satu alat sekuriti yang berdikari dan lebih dipercayai.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

This project is an introduction of a security system with communication capability which consists of two sections which include the development of movement detection system and the telephone dialer system. The project implemented the PIC microcontroller and combination of other handful electronic components in developing the system.

Generally, the telephone dialer system is connected to movement detection system through a relay. This system is compatible with the Microchip PIC 16F84A. Basically, the hardware is a mini-terminal controlled by a 16-pin PIC.

This project will dial preprogrammed telephone number and sends a warning tone via a modem since the movement is detected. The system will be activated when the owner is leaving the house is a period of time.

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1.2 OBJECTIVE

The purpose of this project is to achieve of operational a security system with communication capability by modified the existing security alarm system through the combining of the security alarm system and dialer system. The project will overcome the lack of application of existing security alarm system where the new system will be more independent and reliable device.

1.3 SCOPE OF WORK

The scope of work of this project will cover the development of a movement detection system with the communication capability. This project will be focused on two features which are movement detection system and dialer system. The movement detection system uses the PIR 325 (Passive Infrared) as the motion sensor. The signal received will be amplify to make sure it can be a useful to system. Then the signal will trigger the brain of this system which is the PIC microcontroller where then send the signal through the modem to dial the preprogrammed number. The main component of this project is the PIC microcontroller which requiring the use of assembly language in order to build the program.

1.4 PROBLEM STATEMENT

This project is an alternative way to overcome and extend the application of existing security system. Generally, a security system consist an alarm which producing either sound or light obviously. Besides, the existing alarm system is a dependent system which depends on the neighbours to inform the authority or to the owner about any incident regarding the house. The importance to design security alarm with dialer system is to be more independent device which when it detect any movement especially human movement, then the alarm condition occurs, it will sends

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commands to the modem to automatically dial the set of number either to the authority or to the owner becomes demanded. Here, the motion detection system with communication capability is proposed.

1.5 PROJECT OVERVIEW

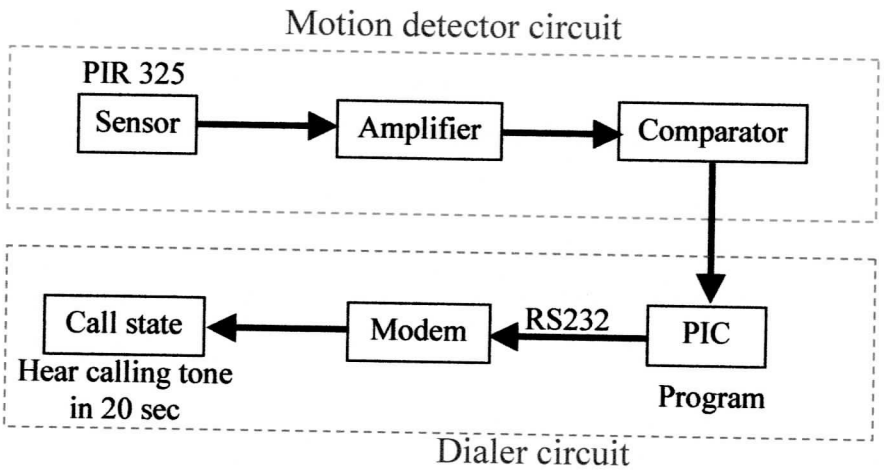

Figure 1.1: Overall Project Block Diagram

The Figure 1.1 explains the overall block diagram of the basic project flow. The methodology of this project is divided into two sections which are the motion detection section and the dialer section. In motion detection section, the approach will be around the PIR 325 which is the motion detection sensor. While in the dialer section, there are several part involved which are the programming part and process of connection to the modem through the RS232. The connection between the sections is through a relay which describe as the motion detection section will trigger the dialer section.

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1.6 THESIS STRUCTURE

The content of this thesis is about the flow of the project. This thesis is consists of five chapters. In the Chapter I, the project overview which the objective, scope of work, problem statement and project methodology are briefly discussed which purposely to provide the reader an understanding of the project introduction.

Chapter II embracing the literature review of the project which includes the concept, theory, perspective and the method of the project that is used in order to solve the problem occurs and any hypothesis that related with the research of methodology.

Chapter III is about the research methodology of the project. This chapter will discuss the method or approach that used in project development including in hardware and software aspect.

Chapter IV discusses briefly on the observations, results and the analysis of the project that gain during the development of project. This chapter also consists of the recorded data analysis and the result of the project.

Chapter V covers the discussion of whole contents of the thesis and project and the suggestion for improvement process in the future research and overall conclusion of the project.

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CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter embracing the literature review of the project which includes the concept, theory, perspective and the method of the project that is used in order to solve the problem occurs and any hypothesis that related with the research of methodology.

2.2 CONCEPT OF PROJECT DEVELOPMENT

Nowadays, to feel safe and own safety environment has become more difficult especially to the residence although the house has been implemented with the best security system available in the market, but still have the insecure feeling when the owner was far apart with the house. It is because the available system is a dependable system which depends to the neighbours to inform the authority or to the owner hours later after the incident. The importance to design security alarm with dialer system which an independent and more reliable system where able to automatically dial the set of number either to the authority or to the owner becomes demanded. Here, the motion detection system with communication capability is proposed.

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2.3 THEORY

2.3.1 Motion detection

Motion detection is the action of sensing physical movement in a given area.

In physics, **motion** [1] means a continuous change in the location of a body. Change in motion is the result of applied force. Motion is typically described in terms of velocity, acceleration, displacement, and time. An object's property called momentum is directly related to the object's mass and velocity, and is conserved within a system, as described by the law of conservation of momentum.

Motion can be detected by measuring change in speed or vector of an object or objects in the field of view. This can be achieved either by mechanical devices that physically interact with the field or by electronic devices that quantifies and measures changes in the given environment. When motion detection is accomplished by natural organisms, it is called motion perception.

Motion perception [2] is the process of inferring the speed and direction of elements in a scene based on visual input. Although this process appears straightforward to most observers, it has proven to be a difficult problem from a computational perspective, and extraordinarily difficult to explain in terms of neural processing.

The older version of the motion detector is design mainly based on mechanical devices where the design is applying more disadvantages than the advantages and not very practical to be applied for home-based security system. Then for the solution, there was a several invention with the application of motion detection system using the electronic devices. The design then, is smaller and more practical for home-based security system.

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2.3.2 **Mechanical devices**

A tripwire is a simple form of motion detection. If a moving object steps into the tripwire's field of view (i.e. trips the wire), then a simple sound device (e.g. bells) may alert the user. A glass filled to the brim so that surface tension causes a convex meniscus can be placed on top of an object to detect if the object has moved.

Mechanical motion detection devices can be simple to implement, but at the same time, they can be defeated easily by interrupting the devices' mechanics (e.g. by "cutting the wire" or "drinking the water"). Electronic motion sensing devices, such as motion detectors, can prevent such mechanical intervention [3].

2.3.3 **Electronic devices**

The principal methods by which motion can be electronically identified are optical detection and acoustical detection. **Infrared** light or **laser** technology may be used for optical detection [5]. Motion detection devices, such as motion detectors, have sensors that detect movement and send a signal to a sound device that produces an alarm or switch on an image recording device. There are motion detectors which employ cameras connected to a computer which stores and manages captured images to be viewed later or viewed over a computer network.

The chief applications for such detection are:

(a) detection of unauthorized entry,

(b) detection of cessation of occupancy of an area to extinguish lighting,

(c) detection of a moving object which triggers a camera to record subsequent events.

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The motion detector is thus a linchpin of electronic security systems [4], but is also a valuable tool in preventing the illumination of unoccupied spaces. A simple algorithm for motion detection by a fixed camera compares the current image with a reference image and simply counts the number of different pixels. Since images will naturally differ due to factors such as varying lighting, camera flicker, and CCD dark currents, pre-processing is useful to reduce the number of false positive alarms. More complex algorithms are necessary to detect motion when the camera itself is moving, or when the motion of a specific object must be detected in a field containing other movement which can be ignored. An example might be a painting surrounded by visitors in an art gallery. There are a wide variety of motion detectors available currently. To allow a better understanding of motion detectors, the following section provides a detailed description of a few different types.

2.3.3.1 **Ultrasonic Motion Detectors**

Motion sensors have been used with alarm systems since the 1970's [6]. Back then, motion sensors were based on ultrasonic technology. Sound waves were emitted from a sensor and the resulting reflected sounds were analyzed to detect changes. When a change was detected, the motion sensor notified the alarm system's control panel, (or whatever it was connected to). Ultrasonic transducers can be used to detect motion in an area where there are not supposed to be any moving objects. This type of motion detector is most commonly used in burglar alarm systems since they are very effective in this application.

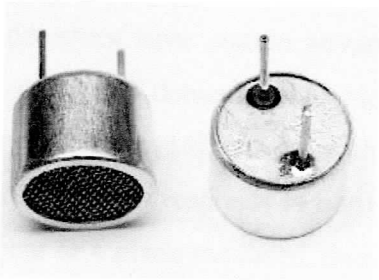

Figure 2.1: Ultrasonic Sensor

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