MOTION DETECTION USING PASSIVE INFRARED SENSOR

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

Faculty of Electronic Engineering and Computer Engineering

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Special dedication to my beloved parents

Gan Seo Kang and Ng Siew Hwa

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ABSTRACT

This project is about the motion detection using Infra-Red sensor. This project is aim to build a sensor system which is transmit and receive the signal in wirelessly. Besides that, it also acted as an auto power switching system. When the sensor is triggered, the signal will transmit wirelessly to take further action. For this project, I will relate this sensor system with an auto power light switching system. Which mean when the sensor is triggered, light in a room will automatically switch ON. In order to transmit signal wirelessly, this project will used radio frequency module to transmit the signal. For the controller circuit part, this project will use Programmable Interface Controller (PIC) to control the circuit, because it is cheaper and easier to program. The objective of this project is tending to switch ON the light automatically and fan based on the temperature. Besides that, signal transmit wirelessly can avoid the circuit malfunction because of wire broken. After done some research from the internet and advice from the lecturer, tools and equipment are identified to completing the project. Current temperature will shows on a LCD display.

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ABSTRAK

Projek ini adalah mengenai dengan menemukan pergerakkan bagi manusia dengan menggunakan sensor infra merah. Projek ini bertujuan untuk membina satu system yang boleh menghantar isyarat dari sensor dengan wayerless. Selain itu, system ini juga adalah suatu kawalan bagi lampu dan kipas tenaga elektrik. Sekiranya sensor dapat mengesan pergerakkan, lampu akan menyala dan kipas adalah terpulang pada suhu bilik. Semasa suhu bilik tinggi, kipas akan berfungsi dan semasa suhu rendah, kipas tidak akan berfungsi. Untuk memastikan isyarat dari sensor dapat menghantar secara wayerless, alat radio frekuensi akan digunakan. Bagi kawalan untuk litar tersebut, Programmable Interface Controller (PIC) akan digunakan kerana ia lebih murah dan senang diprogram. Objektif utama bagi projek ini adalah memastikan system ini dapat menghantar isyarat dari sensor dengan wayeless dan boleh mengawal tenaga elektrik bagi lampu dan kipas dengan bergantung pada pergerakkan manusia. Bacaan suhu bilik akan keluar dari LCD. Kebaikkan bagi penghataran isyarat wayerless adalah ia tidak tergantung pada wayer dan senag dikesan sekiranya mempunyai masalah. Alat-alat tentang projek ini telah ditentukan selepas berbincang dengan supervisor dan mencari data dari internet.

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CHAPTER I

INTRODUCTION

1.1 Background

This project called "motion detection using Infra-Red sensor" which is sensor sense a human motion and then transmit the signal wirelessly. However, this project will relate to auto power ON light and fan system. When the sensor senses a human motion in the sensor's detection area, sensor will be triggered and then the room's light will automatically switch ON. It is useful for us when we cannot find the switch in the dark condition. [1]

For the fan's function, it is depends on the room temperature, when the temperature is higher, fan will run when the PIR had detect motion in the detection area. When the room temperature is low, fan will not run. Degree of temperature is measure by the temperature sensor and temperature will show on a LCD display (2x16).

Light and fan will automatically OFF when the user was going out from the room. As long as PIR sensor does not detect motion in the detection area, light and fans are not function and the fan is depends on the room temperature. Once the sensor is

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triggered, system will have around 2 minutes to run the function. After 2 minutes and sensor does not detect any motion, light and fans will be switched OFF automatically.

1.2 Objective

The main objective for this project is to ensure that the sensor's signal will transmit wirelessly .When the sensor is triggered and the signal will transmit wirelessly and the light will switch ON automatically. Besides that, PIC also needs to ensure can function well in order to control the circuit for receive signal and switch ON the light or fan.

It is also a green project since it can save a lot of electric energy in the long term. Users may forget to switch OFF the light or fan when they are going out. With this system, they do not have to worry about it because when they step out the room, light and fan will switch OFF automatically. This project can be implemented in several places, such as bedroom, office or others. [2]

1.3 Problems

For nowadays, we will switch OFF the light when we are going out from the office or sleep in the bedroom. However, some people might wake up during at night. When they wake up, their mental might not so clear and it is hard for them to find the switch to switch ON the light. Therefore, if they have a motion detection system to switch ON the light automatically, it is easier for them to avoid cannot find a switch and occur accident.

With this system, users do not have to turn ON the light or fan manually. Once users entered the room, light will turn ON and fan is depends on the temperature. It is convenient to the old people and some handicapped people who are sitting on the wheelchair. Besides that, kids will not fall down and get injure when they are go to toilet at night.

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Besides that, wireless technology is popular in 20^{th} century because it is convenient, easier to construct, and save cost. User can get the signal in the long range without wiring. With wireless, they can save cost and easy to change the location of the devices without rewiring.

Users have to switch ON the fan when the temperature is hot, but somehow weather could be cold at night during raining, so they have to switch OFF the fan or air conditional. When the temperature is changed from low to high, they also no need to switch ON the fan manually. By setting the require temperature, they do not have to switch ON or OFF the fan manually. It will be more convenient for them since the fan will ON or OFF automatically.

It is very convenient to the business men who have to build swallow's house. They get the bird's nest from the swallow. Swallow likes to live in the low temperature situation, so the house has to always keep in low temperature. By setting the temperature, when the temperature is high, fan or air conditional can ON automatically to down the temperature.

1.4 Project Scopes

Scopes of this project are mainly focus in the motion detector system and auto power ON system. All the factors will affect the performance of this project. Based on the literature review will get those factor solution. Below are scopes for this project:

i. Motion detector

   A sensor is needed to sense human motion in certain area. Therefore, the detection area to trigger the sensor is set to approximately 120^0 within 1 meter range.[3]

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ii. Transmit and receive signal wirelessly

Signal need to transfer to the receiver by wirelessly. The range is not so wide since it is used in a room. So the range for the wireless device to transmit the signal can up 100 meters.

iii. Microcontroller

There are a lot of types of microcontroller in the market. However this project is used to transmit and receive data, display the room temperature on LCD display, and control the light and fan. So for the microcontroller's pin can choose 28 pins to ensure the pins are enough reduce the cost and scope of research for microcontroller.

iv. Temperature sensor

This device is used to measure the room temperature to control the power fan. It is measure in degree of Celsius with range (-55^0~ $+155^0$).

v. Power supply

Power supply for this circuit is low since all the component or equipment can operate in low voltage. In order to avoid high voltage will cause wasted or spoil the circuit, low voltage like 5V is predominant.

1.5 Short Discussion for Methodology

Literature review done by searching data from the internet and books from the library. Procedures stated in the flow chart are followed. Equipment and tools that are going to use in this project had chosen by study from the literature review through internet and advice from the supervisor.

Besides that, circuit is drawing in schematic diagram by using software Proteus 7 to stimulate the circuit. Then the circuit is constructed by using breadboard to testing the functioning of the circuit to ensure it can work well.

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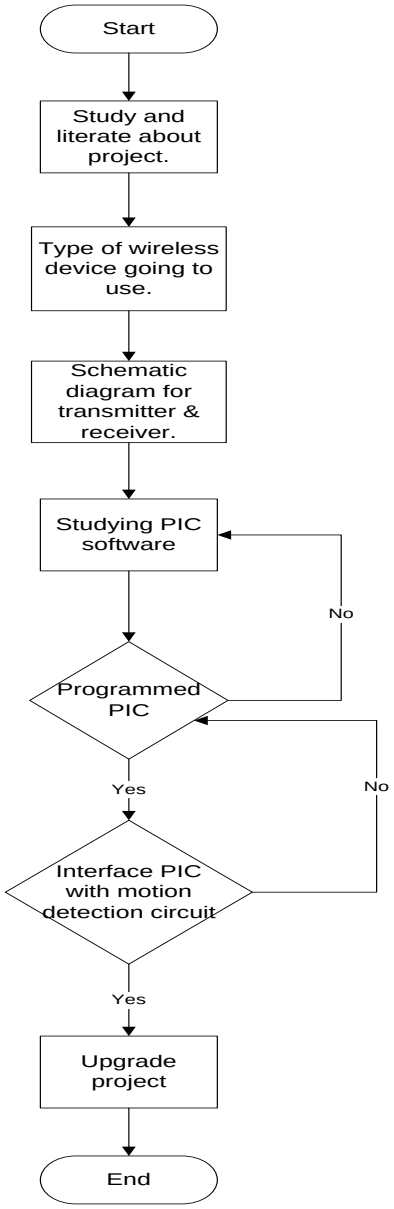
After testing on the breadboard, circuit is built by soldering those electronics component on the strip board or on PCB board. Final is testing the circuit to ensure it can function well. Below is the flow chart of the project.



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1.6 Thesis Structure

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

Chapter II is 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 the software and hardware aspect.

Chapter IV will discuss about result and the analysis of the project that gain during the development of project. This chapter also will include the final product of the project and describe function of the project in diagram.

Chapter V covers the discussion of the whole contents of the thesis and project 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 wills briefly embracing the literature review of the project which is 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 the methodology.

2.2 Concept of the Project

This project is an auto power ON system and the signal of the sensor is transmit in wirelessly. Power ON system is including light, fan, and LCD display for the temperature.

The objective of this project is to use inexpensive PIR sensor to detect if a human has moved. To build this project I use an encoder and RF transmitter with frequency 433MHz to transmit signal. For the receiver will have a decoder and then connected to the main circuit. Microcontroller from the circuit will get the signal from receiver circuit.

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Therefore, when the sensor had change state and it will control the switch to switch ON the light. Sensor's signal will be transmit and receive in wirelessly.

When the sensor had detected human's motion, signal from the sensor will be transmit by a radio frequency transmitter and then receive by a radio frequency receiver. When the receiver gets the signal, it will transfer the signal to the PIC16F876A. Microcontroller will get the signal and then switch ON the light and fan if the temperature is more than 40^0c. Fan is depends on the room temperature, when temperature is low fan will not turn ON unless temperature is increase to high. LCD display will show the temperature. IF the temperature is high, fan will not function since there is no people in the detection area detect by the PIR sensor. Once the sensor does not triggered, power for the light and fan will switch OFF. The delay time for the PIR sensor should set longer time around 5 minutes. It can prevent the system always ON and OFF the light and fan.

2.3 Theory

2.3.1 Motion Detection

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 quantify and measure changes in the given environment. When motion detection is accomplished by natural organisms, it is called motion perception.

Motion can be detected by: sound (acoustic sensors), opacity (optical and infrared sensors and video image processors), geomagnetism (magnetic sensors, magnetometers), reflection of transmitted energy (infrared laser radar, ultrasonic sensors, and microwave radar sensors), electromagnetic induction (inductive-loop detectors), and vibration (triboelectric, seismic, and inertia-switch sensors). Acoustic sensors are based on: electret effect, inductive coupling, capacitive coupling, triboelectric effect,

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