

ENERGY EFFICIENT OF AUTOMATIC CEILING FAN

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**This Report Is Submitted In Partial Fulfillment Of Requirements For The
Bachelor Degree of Electronic Engineering (Industrial Electronic)**

**Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka**

2012



UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : Energy Efficient of Automatic Ceiling Fan

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

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DEDICATION

To my beloved parents for the love that arose for me until today
My supporting brothers and sisters that never stopped praying for me
and
My entire friends and lecturers for the encouragement and ideas

ACKNOWLEDGEMENT

Alhamdulillah, praise to Allah S.W.T for the guidance and blessing bestowed upon me, for without it I would not have been able to come this far.

I wish to thank with appreciation, Nur Fatimah binti Azmi, my project supervisors for their advice, understanding, well guidance and help throughout this project. Without their valuable suggestions and encouragement, this project would have not been successful.

A special thank to my family especially my parents who encouraged me in my final year here and gives me lots of inspiration. May Allah S.W.T bless both of you. Not forgotten to all my fellow friends for their brilliant ideas, support and encouragement throughout the duration of this project. Thank you all so much. Lastly, my heartfelt appreciation goes to all, who have directly or indirectly helped me to make this project a success.

ABSTRACT

Over the last decade, advances in digital electronics have made computer smaller, cheaper and faster. Throughout this revolution as well, mobile computing environment such as PDA has been created and undoubtedly other advances in technology like smart home also play an important role towards better life in the future. This project is about how we can control the fan based on temperature sensor regardless of traditional thermostat. It is also part of smart home application where the fan will gradually increase the speed if the temperature in the environment is increasing. Besides that, the component that made up the temperature sensor is known as rheostat. A sensor is a type of transducer. In a broader sense, a transducer is sometimes defined as any device that converts energy from one form to another. The ceiling fans objectively build to control the room temperature to appropriate condition. There are several advantages of using ceiling fan. For example, people prefer to use ceiling fan instead of using the air conditioner due to easy installation, cheap maintenance and also it is really the suitable equipment to control the room temperature in South East Asia area. In fact, the ceiling fan also can be used to blow wind and act as an agent to dry up the clothes. This project aims to give benefit by providing an effective way in controlling ceiling fan mechanism and monitor the room temperature automatically.

ABSTRAK

Peralihan zaman telah membawa banyak kemajuan dalam bidang elektronik. Antara perubahan yang boleh diperhatikan ialah penciptaan komputer riba yang jauh lebih murah dan laju pemrosesannya. Di samping itu juga, penciptaan PDA yang membolehkan kita mengawal sistem di rumah memainkan peranan yang penting ke arah kehidupan yang lebih baik dan selamat pada masa akan datang. Dengan itu, projek ini dicipta bertujuan untuk memudahkan orang ramai untuk mengawal kipas menggunakan sensor suhu berbanding kipas siling yang telah wujud pada masa ini. Kipas yang telah wujud selama ini hanya dikawal menggunakan suis atau pusingan termostat manakala kipas yang dicipta ini dikawal sepenuhnya menggunakan sensor. Konsepnya adalah kipas akan berubah kelajuan mengikut suhu di dalam sesuatu bilik tersebut. Komponen-komponen yang penting dalam projek ini ialah, sensor suhu, sensor pergerakan dan mikropengawal. Dengan menggunakan mikropengawal, pengiraan akan diprogramkan ke dalam PIC 16F877. Selepas itu hasilnya akan dipamerkan di paparan LCD. Apabila seseorang memasuki sesebuah bilik, sensor pergerakan dan sensor suhu akan mengesan seterusnya menghantar isyarat kepada mikropengawal. Mikropengawal yang telah diprogramkan akan menghidupkan kipas seterusnya mengubah kelajuan pusingan kipas berdasarkan suhu bilik tersebut. Selain itu juga, terdapat beberapa kelebihan menggunakan kipas siling automatik ini. Sebagai contoh, orang lebih suka menggunakan kipas siling berbanding dgn penyaman udara kerana kipas siling lebih mudah pemasangan, penyelenggaraan yang murah dan dapat menjimatkan tenaga elektrik. Sehubungan dengan itu, kipas siling automatik ini juga dapat mengurangkan penggunaan tenaga elektrik kerana menggunakan konsep nadi lebar modulasi (PWM).

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LIST OF ABBREVIATION

PCB	-	Printed Circuit Board
PIC	-	Programmable Integrated Circuit
PWM	-	Pulse Width Modulation
PSM	-	Projek Sarjana Muda
IC	-	Integrated Circuit
DC	-	Direct Current
AC	-	Alternate Current
LED	-	Light Emitting Diode
ADC	-	Analog Digital Converter
LCD	-	Liquid Crystal Display
RAM	-	Random Access Memory
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
RISC	-	Reduced Instruction Set Computing
SRAM	-	Static random-access memory
POR	-	Power-on Reset
PWRT	-	Power-up Timer
OST	-	Oscillator Start-up Timer
I/O	-	Input Output
LED	-	Light Emitting Diode
EN	-	Enable
RS	-	Register Select
UART	-	Universal Asynchronous Receiver Transmitter

CHAPTER I

INTRODUCTION

1.1 Background

Over the last decade, advances in digital electronics have made computer smaller, cheaper and faster. Throughout this revolution as well, mobile computing environment such as PDA has been created and undoubtedly other advances in technology like smart home also play an important role towards better life in the future. This project is about how we can control the fan based on temperature sensor regardless of traditional thermostat. It is also part of smart home application where the fan will gradually increase the speed if the temperature in the environment is increasing. Almost all the houses in the world especially in Southeast Asia have at least a ceiling fan. It has become very popular among people recent years.

In this project, An Energy Efficient of Automatic Ceiling Fan is created to help people to control their ceiling automatically. The ceiling fans objectively build to control the room temperature to appropriate condition. There are several advantages of using ceiling fan. For example, people prefer to use ceiling fan instead of using the air conditioner due to easy installation, cheap maintenance and also it is really the suitable equipment to control the room temperature in South East Asia area. In fact, the ceiling fan also can be used to blow wind and act as an agent to dry *up the clothes*.

1.2 Objectives

There are several objectives of this project. Besides that, this project will create the talent of student to apply their knowledge in this final year project. The objectives are:

- To build an automatic fan controller based on temperature sensor.
- To create detection system that aims to detect human's motion experience
- To reduce the usage of electric
- To explore the functional of PIC
- To understand more in C programming
- Will be easier for people to control the fan

1.3 Problem Statement

Fans are widely used in industrial and commercial applications. From shop ventilation to material handling to boiler applications, fans are critical for process support and human health. In commercial sector, electricity that is needed to operate fan motors composes a large portion of energy costs for space conditioning. In home application, most of us use fan rather than air conditioner because it is more economical. The air movement from the fan evaporates moisture on the skin and makes a person feel cooler. Note that the electric power to run the fan comes from alternator. The fan does not cool the room at all. What a fan does is create a wind chill effect. However, sometimes we forget to switch off the fan when it is cool enough. This situation presents a waste of energy that most of us usually don't realize. ^[1]

The basic idea behind this project is to control loss electrical energy in fan motor at ceiling fan operation. Losses of electrical energy will develop too much serious problem especially on the safety of the user.

Toggle switch problem is also a factor towards ceiling fan operation. For information, ceiling fan operation like on/off or speed change mechanism required the switching operation. Problem arrived when new arriving occupants enter to new room and darkened room. They have to search for hard to find the toggle switches to turn on the ceiling fan. Warm of stuffy rooms can be very uncomfortable to new arriving occupant, who would have to wait for the room to cool down and circulate the airflow. ^[1]

Another problem is regarding the usage for electricity. This concern happen widely in house area. For instance, traditional fans are often left on when occupants leave rooms with overhead ceiling fan. Thus, the fans can consume unnecessary power in unoccupied rooms.

Even though, all the control is automatically, there is a manual keypad to control the fan. In case, in sunny day, our temperature will increase and we need to cool it down quickly. So we can switch the speed base on our desire.

1.4 Scopes

The aim of this project is to improve the system of ceiling fan nowadays. In order to aim the goal, there are some Project Scopes to follow. There are:

- Functionality check on temperature sensor.
- The reliable motion sensor for human detection.
- It use microcontroller to synchronize between the temperature and human's detection with the induction motor inside the fan system.
- This project will focus on how to implement a controller based model to count number of persons visiting particular room.
- The programmable integrated circuit (PIC16F877A) which functions as main brain of the project.

1.5 Significant of the Project

The significant of the Intelligence Integrated Power Factor with Microcontroller device are:

- Automatically switch ON/OFF based on temperature in the room.
- The speeding of the fan will be change based on the number of people in the room.
- As the people increase, the temperature will increase. Hence, the speed of fan will increase too.
- Present ceiling fan are controlled by variable resistor for changing the speed but now, the fan are controlled by frequency (PWM).
- Other than that, this fan will reduce the usage of electric and will reduce the wastage of the electric.
- By saving up the electrical energy, it also can save the monthly utility bill.

1.6 Project methodology

In this part, I have cover three main things to finish my project which are project planning, literature review and expected part of the project. The below will be the main topic and sub topics that will be further elaborated in the report.

1.6.1 Project planning

- Start choosing the project based on observation
- Discuss with supervisor about the topic
- Understanding the concept and theory of the project.
- Prepare Gantt chart for guidelines and progress of the project.

1.6.2 Literature review

- Search some journals related to my project
- Search some suitable and practical circuits.
- List down and identify the suitable components that using in the project.
- Design a prototype circuit boards and assembling.
- Test and do analysis to the circuits.

1.6.3 Expected Result

- Record the data from parameters
- Testing of final assembly circuit in operation, application records the results.
- Presentation of the project.
- Finishing the technical report of for PSM 1.

1.6.4 Flow Chart of Project Methodology

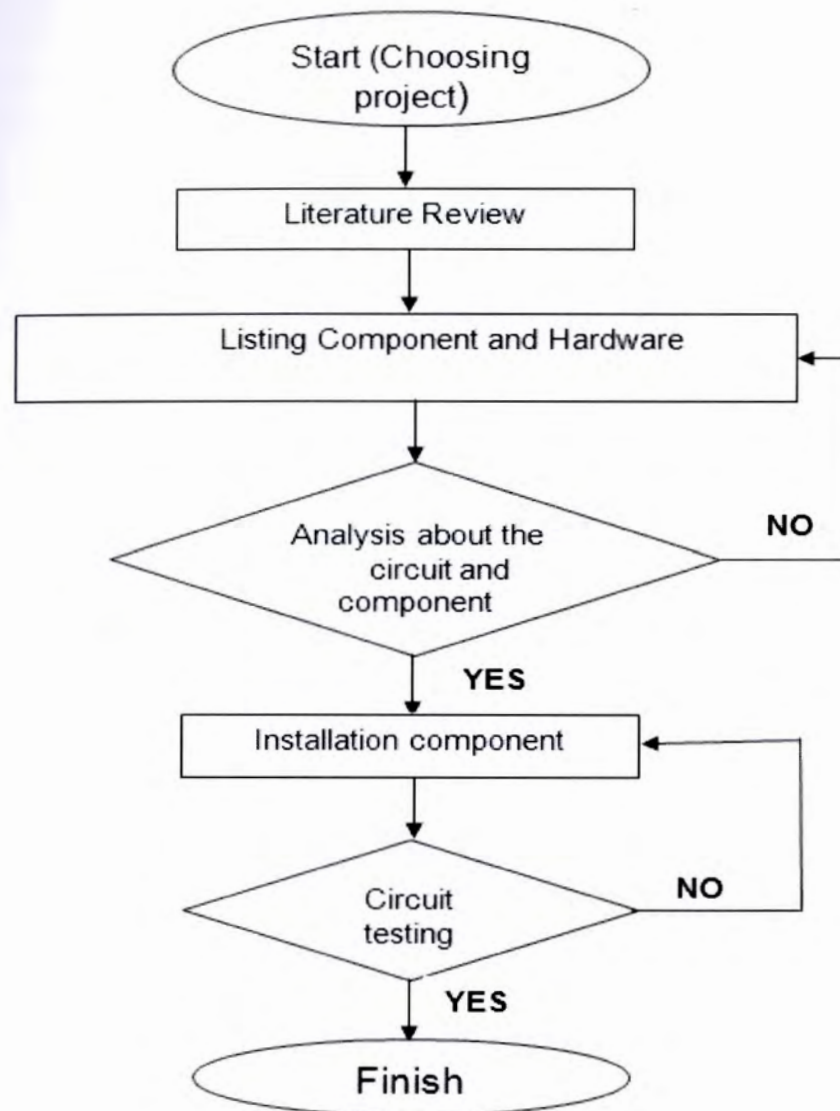


Figure 1.1: Project methodology flow chart

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

Wikipedia.com define temperature control is a process in which the temperature of an object is measured and the passage of heat energy into or out of the object is adjusted to achieve a desired temperature. According to Tito Smailagich, given the high cost of electrical power, replacing a conventional on/off temperature control with a proportional controller can often save energy and money.

The idea to proceed with my project, An Energy Efficient of Automatic Ceiling Fan is the result of observation problems faced by people nowadays, which is the wastage in using electric. From there, I come out with an idea to solve the problem based on the problem statement that stated above. After doing some research by reading journals, I start to plan the work on how to make my project success.

The automatic ceiling fan controller consists of temperature sensor and human motion sensor that will be connected to microcontroller chip. Then, it will be programme based on the algorithm principle to receive the input from the combination of the sensors and present the output as the speed of fan motor system.

This review is basically an introduction of temperature and motion detector and how does it works. Lot of researches on the internet had been done to observe different types of sensor configurations. There are lot of variations on hardware and software used by different kind of user to utilize the automatic fan controller. Below states what are the basic components of an energy-efficient of ceiling fan system:

- i. Microcontroller chip- the core of the automatic fan controller. Function as to receive signal from the sensors and send the signal to AC fan motor.
- ii. Temperature sensor- to detect the temperature values and convert it in term of voltages. The voltage's reading will transfer to microcontroller chip.
- iii. Infrared sensor- detects human by measuring changes in infrared levels emitted by human appearances.
- iv. LCD- to display the temperature detected by the temperature sensor.
- v. Motor driver- to control motor.
- vi. DC motor- it basically connected by the output microcontroller chip. The output voltage will be used as the reference in order to determine fan speeds.

2.2 Control circuit

Control circuit is also the important part in this project. The control circuit role is to make sure that the project can be function well as the planned. In this project, I have chosen Microcontroller circuit. This control circuit are use to make sure that the circuit can operate and perform well in future.

2.3 Components and equipment

There are many electronic components that will be used during the development of temperature controlled fan circuit. There are some that we familiar with and some are rarely used. All components play its important role and interrelated between each other in completing the circuit design.

2.3.1 Specifications of PIC16F877A microcontroller



Figure 2.1: PIC16F877A

PIC16F877A is a small piece of semiconductor integrated circuits that being developed by MicroChip Inc. The package type of these integrated circuits is DIP package. DIP stand for Dual Inline Package for semiconductor IC. This package is very easy to be soldered onto the strip board. However using a DIP socket is much easier so that this chip can be plugged and removed from the development board.

PIC16F877A is characterized by RISC architecture. It is one of the chip microcontroller programmer, it function is simple to use and low cost. This microcontroller can program, read and verify code data, write lock bits, erase and blank check and it has a maximum clock speed of 40 MHz. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port. PIC16F877A special microcontroller features ^[2]:

- Flash Memory: 14.3 Kbytes (8192 words)
- Data SRAM: 368 bytes
- Data EEPROM: 256 bytes
- Self-reprogrammable under software control
- In-Circuit