UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF CONTROL FAN SPEED BY AUTOMATIC TEMPERATURE SENSOR USING ARDUINO

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

by

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Electronics) with Honours. The member of the supervisory is as follow:

……..

(Encik Ahmad Sayuthi Bin Mohd Shokri)

ABSTRAK

Projek ini bertujuan untuk mengkaji dan memperbaharui aplikasi kawalan kelajuan kipas lama yang menggunakan kawalan secara manual, kepada cara kawalan kelajuan kipas yang baru secara automatik dengan menggunakan teknik bacaan suhu semasa bilik oleh penderia suhu. Sistem kawalan kelajuan kipas lama yang menggunakan cara manual adalah teknik yang masih di guna pakai semenjak dari dahulu kala kipas dicipta sehingga kini. Kelajuan kipas lama ditentukan oleh kawalan tangan pengguna yang menentukannya, ianya menyukarkan dan memerlukan tenaga pengguna untuk mengawal kelajuannya. Manakala, dengan adanya kawalan kipas secara automatik ini, ianya memudahkan, menjimatkan kos bil elektrik dan kos tenaga pengguna. Malahan ianya tampak lebih sistematik dan berteknologi, dengan paparan suhu semasa bilik dan kelajuan kipas yang sedang berputar. Justeru itu, kawalan kipas automatik ini tidak menggunakan kawalan suis buka atau tutup secara manual, ianya menggunakan alat penderia bunyi untuk mengesan bunyi tepukan tangan bagi menghidupkan atau mematikan suis. Malahan ianya ditambah pula dengan kawalan suis had yang dipasangkan di pintu utama bilik ataupun rumah, yang berfungsi untuk mematikan suis dan fungsi kipas jika pengguna terlupa untuk mematikan suis dengan tepukan tangan ketika ingin keluar dari rumah. Keseluruhan proses ini dilakukan dengan pemprograman yang telah ditetapkan dalam Arduino UNO, yang melaksanakan gerak kerja dari proses awal hingga akhir.

ABSTRACT

The project aims to study and renew old fan speed control applications using manual control, to control how the new fan speed automatically using the current temperature reading room by the temperature sensor. Old fan speed control system using the manual method is a technique that still prevails since ancient fan created until now. Old fan speed is determined by the user's hand control to define it; it's difficult and requires energy users to control its speed. Whereas, with this automatic fan control, it's convenient, cost-effective electricity bills and energy costs consumers. In fact, it looks more systematic and technologically, to display the current room temperature and fan speed spinning. Therefore, the automatic fan control does not use a control switch on or off manually, it uses sound sensors to detect the sound of applause to turn on or turn off the switch. In fact it is coupled with the control limit switch installed at the main entrance of the room or house, which serves to turn off the switch and fan function if users forget to turn off the switch with applause when they want out of the house. This whole process is done with the programming that has been set in the Arduino UNO, who carries out the work from the beginning to the end.

DEDICATION

To my beloved parents, family members and friends.

ACKNOWLEDGEMENT

In the name of Allah s.w.t. , the Most Beneficent and the Most Merciful. A deep sense of thankfulness to Allah s.w.t. who was has given me the full strength, ability, and patience to complete this Bachelor Degree Project as it is today.

Firstly, I would like to take this opportunity to put into words my deepest gratitude and appreciation to my project supervisor Madam Nurliyana Binti Mutalib and my co-supervisor Mr Ahmad Sayuthi Bin Mohd Shokri for the support, guidance, patience, encouragement, and abundance of ideas during the completion of this project. Secondly, special thanks to both honourable panels, for their comments, invaluable suggestions, and outstanding deliberations

to improve the project during the project presentation.

I would also like to express my extraordinary appreciation to my family especially to my parents, Mr Osman Bin Samat and Madam Ami Bte Atan and also to my family members for their invaluable support along the duration of my studies until the completion of this Bachelor Degree Project. Finally, yet importantly, thanks to my beloved friends who are directly or indirectly contributed due to their supports and guidance and helped greatly to point me in the right direction until the completion of this Bachelor Degree Project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

CPU	-	Central Processing Unit
IC	-	Integrated Circuit
DC	-	Direct Current
PID	-	Proportional-Integral-Derivative
ASIC	-	Application-Specific Integrated Circuit
LED	-	Light-Emitting Diode
eg.	-	Example
IR	-	Infrared
IRED	-	Infrared-Emitting Diode
CRT	-	Cathode Ray Tube
TFT	-	Think Film Transistor
LCD	-	Liquid-Crystal Display
CMOS	-	Complementary Metal Oxide Semiconductor
AVR	-	Aboriginal Voices Radio
I/O	-	Input or Output
PWM	-	Pulse with Modulation
µ	-	Micro

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter includes overall about the project background, problem statement, objectives, scope, and outline of the project in order to give an overall view of the project.

1.2 Background

As we know, today fan is control the speed by manual. This project is to design a fan speed which is controlling by automatic temperature sensor using an Arduino UNO microcontroller. The system is designed to convert existing fan controlled by manual ways to automatic temperature reading. The temperature sensor is used for taking temperature in a room. Room temperature reading is taken to determine the rotation speed of the fan to meet the convenience of users. The room temperature had been measured and speed of fan will be display at LCD. Arduino UNO microcontroller used in this project, as the application when we hand claps and the switch will turn ON automatically to moves the operating function to read the room temperature and determine speed of fan. To turn off the switch, the user must claps hand again to turn OFF the fan and switch. Furthermore, the limit switch is used at the room door or main door to turn OFF the switch and function of fan. This fan function is designed as an enhancement to the existing fan system nowadays.

1.3 Problem Statement

This project is about to create new function for activate the switch ON/OFF at supply automatically using hand claps and to control the speed of fan by automatic temperature sensor using Arduino UNO. This old function need to be changed because the fan today is functioning manually to control the speed of fan for given comfort to the users. There are lots of steps for control the speed of fan, if the old function still used it's not parallel to development of technology nowadays.

1.4 Objectives

The main objectives of the project as below:-

1) To learn how to use the Arduino UNO Microcontroller.
2) To learn how to do a program for detect hand claps, temperature and control speed of fan.
3) To design a circuit automatic temperature and implement the process

1.5 Scope of Project

This function is build based on the previous model of fan and for build this function the hardware and software is used. The important part use in this project is a Arduino UNO Microcontroller. The Arduino UNO microcontroller functioning as a main part for controls this function. Among them is to control switch ON/OFF, limit switch, set the speed of fan for low, medium and high based on room temperature that are taken automatically by using temperature sensor. The programming uses in this project will be compile using Arduino UNO software and then been upload into the Arduino UNO microcontroller to implement the process. All the process that's have been set up in the program to generate speed of fan using automatic temperature measurement. To simulate the circuit Proteus 8.0 software is used in order to know the circuits function.

1.6 Outline of Project Report

The outline project of this report is separate into five sections to make clearly view about this project. The first section of this project is to elaborate strongly about the system operation and hardware that has been made in this project to make sure it's along and parallel with the aims and objectives of this final year project. Some review paper from the past and previous of researches with the same topic was been explain into section two. For the section three, it more to explain the details about the method or the way and to make the implementation steps of this project. Section four is discussed all the findings, results, discussion, and analysis about this project. And lastly of the section of this project is section five that to summarize the conclusion and made recommendation for future study that can use to improve for this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the literature review which contains the information and ideas in completing the project is discussed. There are several sources that had been taken as a resource such as books, thesis, journal and website. It was included the operation of the circuit, the hardware and software which is useful in the project. Other than that, in this chapter also make a study about several projects that related to make some improvement or take some idea from the other project. It is useful to complete a project that has been created and we compared this project from the previous project to make this project more efficient and systematic.

2.2 Research from Previous Project

Based on the previous project, it was needed as the references to complete this project successfully. It was useful to upgrade and modified the system that has been demonstrate before. Other than that, according to current developments, the latest technology used in this project to solve the problems faced at present.

One of system is a smart fan for human tracking using PIC16F73 (Tajrin Ishrat 2014). A research work focused on automatic person detection system by using IR sensor detection accuracy decreases with increasing reflection distance and change in detection results due to the differences in weather conditions. The system was implemented by using ultrasonic distance sensor to minimize the sensor's limitation for human tracking system compare [1], then this project is using the

temperature sensor LM35 for reading temperature in room. Other than that, this concept using a lot of money because used the ultrasonic distance sensor and the costing of maintenance is more expensive.

The next project is global fan speed control considering non-ideal temperature measurements in enterprise servers (Jungsoo Kim 2014). The system was implemented by using Proportional-Integral-Derivative (PID) controller to the operating fan speed and eliminating fan speed oscillation caused by temperature quantization [2], and then this project is use the Arduino UNO to save the cost and easy to develop. The different from previous research that are design to control speed of fan at CPU temperature and this project is to design the control speed of fan in room temperature.

From the previous project a monolithic fan speed control IC for monitoring temperature and improving power efficiency (Yuan-Ta Hsieh 2012), this project is using thermal sensors to monitor the temperature within the ASIC and a boost DC-DC converter to drive cooling fans and improve power efficiency [3]. The thermal sensor is used for detect human temperature at surrounding difference with this project is using the LM35 sensor for reading the temperature in room.

Another more, from the previous project is about automatic fan speed control system using microcontroller that has a similarity with this project (Mustafa Saad 2014). The project is use a LM35 temperature sensor to measure the temperature and display on the LCD the temperature and speed of fan. But in this project, they are used PIC16F877A microcontrollers to apply in this function and differences with this project that used an Arduino UNO to control a speed of fan, sound sensor circuit; temperature sensor circuit, LCD display and limit switch circuit. This previous project is just controls the speed of fan by current temperature and shows the speed of fan in rpm at LCD display [4], different with this project that use average percentage that been set in instruction, that is 0%, 10%, 20% until 100%.

Furthermore, from the previous project automatic temperature controlled fan using thermistor (Sushma Verma JULY 2016). The project is use a thermistor as sensor for read the current temperature. The concept is read the temperature from PC to control the speed of fan respectively increases and decreases by automatically [5]. That not used any microcontroller to control the process.

Moreover, from the previous project room temperature based fan speed control system using pulse width modulation technique (Vaibhav Bhatia NOVEMBER 2013). This previous project is use the temperature LM35 to detect the temperature at room. The process to design also used the Proteus 8.0. The different with this project is the microcontroller used the in the project, they are used the MATLAB R2013a v1.8 to authorize the accuracy of the structure and at this project used the Arduino UNO [6].

2.3 Hardware and Software Review

In this part is to review the hardware and software equipment that are used in this project. Some explanation about functioning and information regarding parts and components for the hardware to observed the different between the specifications to develop this project.

2.3.1 Temperature Sensor (LM35)

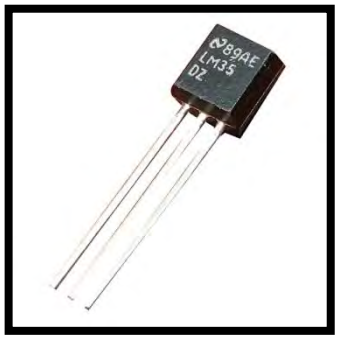

Figure 2.1: Ultrasonic ranging module

The temperature sensor is a device which senses variations in temperature through it. The LM35 datasheet specifies that these ICs are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ˚ Kelvin, as the

user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4˚C at room temperature and ±3⁄4˚C over a full temperature range. This sensor is used in this project for detect and read the temperature in room.

Table 2.1: Characteristics of temperature sensor LM35

Parameter	Description
Supply Voltage	4 to 30 Volt
Temp. Range	-55 to +150 ˚C
Accuracy	±2 ˚C
Output	+10mVolt/ ˚C

2.3.2 Light-Emitting Diode (LED)

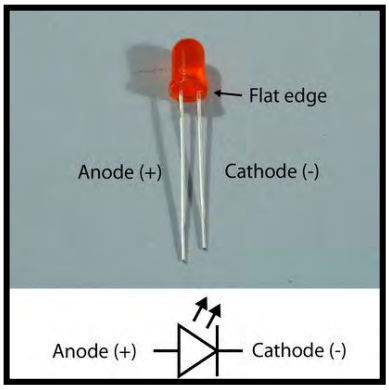

Figure 2.2: Light-Emitting Diode (LED)

A light-emitting diode (LED) is a semiconductor device that emits visible light when an electric current passes through it. The light is not particularly bright, but in most LEDs it is monochromatic, occurring at a single wavelength. The output from an LED can range from red (at a wavelength of approximately 700 nanometers) to blue-violet (about 400