REMOTE CONTROLLER SYSTEM FOR HIGH VOLUME LOW SPEED (HVLS) FAN FOR SURIA GIANT FAN SERVICES SDN. BHD.

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DECLARATION

I declare that this thesis entitled "REMOTE CONTROLLER SYSTEM FOR HIGH VOLUME LOW SPEED (HVLS) FAN FOR SURIA GIANT FAN SERVICES SDN. BHD. is the result of my own research except as cited in the references. The research has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Name : MUHAMMAD IRFAN BIN MOHD SANIP

Date : 07th JULY 2021

APPROVAL

I hereby declare that I have checked this report entitled "REMOTE CONTROLLER SYSTEM FOR HIGH VOLUME LOW SPEED (HVLS) FAN FOR SURIA GIANT FAN SERVICES SDN. BHD." and in my opinion, this thesis it complies the partial fulfillment for awarding the award of the degree of Bachelor of Electrical Engineering with Honour

Signature : .....

Supervisor Name : DR. JURIFA BINTI MAT LAZI

Date : 07TH JULY 2021

DEDICATIONS

To my beloved mother and father who always support me in doing my project and thanks them that I be able to do my final year project 1 peacefully. I also want to offer thanks to my supportive friends with their encouragement and spirit me to complete this thesis.

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Most importantly, acclaims and gratitude to the God, the Almighty, for His showers of favours all through my final year project 1 effectively.

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ABSTRACT

The use of remote controller system for HVLS fan has not available yet in the market during this time. Most of the HVLS fan used analogue controller to change the speed of the fan and also to turn ‘on’ or ‘off’. The customers of Suria Giant Fan Services Sdn. Bhd. (SGFS), have requested for remote control for the HVLS fan. Unfortunately, none of the HVLS fan is equipped with remote controller system. This project aims to design and develop the circuit system that can control the speed of HVLS Fan at certain distance. This remote control is important because usually to control the HVLS Fan, the user need to move to the switch board of the HVLS Fan which is sometimes located at the Main Switch Board (MSB) of that place. The main objective of this project is to design and develop remote control system for HVLS fan. Literature review of this project discussed the operation of the remote controller system and about the previous researches for the methodology that can control HVLS fan motor. The Methodology of this project is shown in the flow chart and block diagram of this project. The development of this project is following all the methodology presented in this report. For the results of this project, the system is designed on simulation software and applied it to the hardware development. Due to restriction of movement order by the government (MCO 3.0), the prototype of this project could not be tested on actual HVLS fan. The existing HVLS fan’s output voltage controller is used as a reference to this project concept. The objectives of this project is achieved by comparing the output voltage of existing HVLS fan’s controller with the new remote controller system that has been developed. Lastly, there are a few things that need to be improved about this project that could not be implemented during the construction of this project. Recommendations that need to be improved have been stated at the end of this report.

ABSTRAK

Penggunaan sistem alat kawalan jauh untuk kipas gergasi belum diteliti secara meluas selama ini. Sebilangan besar kipas gergasi menggunakan pengawal analog untuk menukar kelajuan kipas dan juga menghidupkan atau mematikannya. Pelanggan Suria Giant Fan Services Sdn. Bhd. (SGFS), telah meminta sistem alat kawalan jauh untuk kipas gergasi. Malangnya, tidak ada kipas gergasi yang dilengkapi dengan sistem alat kawalan jauh. Projek ini adalah untuk mengawal kelajuan kipas gergasi pada jarak tertentu. Sistem ini penting kerana biasanya untuk mengubah kelajuan dan menghidupkan atau mematikan kipas gergasi, pengguna perlu pergi ke kotak panel kipas gergasi yang kadang-kadang ia terletak di bilik kawalan sesebuah tempat tersebut. Objektif utama projek ini adalah untuk membina sistem kawalan jauh untuk kipas gergasi dari syarikat Suria Giant Fan Services Sdn. Bhd. Tinjauan literatur projek ini membincangkan tentang pengoperasian sistem alat kawalan jauh dan penyelidikan mengenai kaedah yang dapat digunakan dalam projek ini untuk mengawal motor kipas gergasi. Metodologi projek diterangkan melalui carta alir dan rajah blok dalam penyempurnaan projek ini. Pembangunan projek ini mengikuti semua metodologi yang dinyatakan dalam laporan ini. Untuk hasil projek ini, sistem ini dirancang pada perisian simulasi terlebih dahulu dan menerapkannya ke pengembangan perkakasan. Oleh kerana sekatan pergerakan (MCO 3.0), projek ini tidak dapat diuji pada kipas HVLS sebenar. Pengawal voltan keluaran kipas HVLS yang sedia ada digunakan sebagai rujukan konsep projek ini. Objektif projek ini dicapai dengan membandingkan voltan output pengawal kipas HVLS yang ada dengan sistem alat kawalan jauh baru yang telah dicipta. Terakhir, terdapat banyak lagi perkara yang perlu diperbaiki mengenai projek ini, yang tidak dapat dilaksanakan semasa pembinaan projek ini. Cadangan yang perlu diperbaiki telah dinyatakan di akhir laporan ini.

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LIST OF SYMBOLS AND ABBREVIATIONS

HVLS	-	High Volume Low Speed
SGFS	-	Suria Giant Fan Services Sdn. Bhd.
BLDC	-	Brushless Direct Current
MSB	-	Main Switch Board
PCB	-	Printed Circuit Board
PMSM	-	Permanent Magnet Synchronous Motor
NFC	-	Near Field Communication
IR	-	Infrared
DC	-	Direct Current
AC	-	Alternate Current
DOL	-	Direct On Line
TTL	-	Transistor Transistor Logic
PWM	-	Pulse Width Modulation
IoT	-	Internet of Things
IDE	-	Integrated Development Environment
ISIS	-	Intelligent Schematic Input System
MCO	-	Movement Control Order
NO	-	Normally Open
NC	-	Normally Close
LED	-	Light Emitting Diode
rpm	-	revolution per minute

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CHAPTER 1

INTRODUCTION

This chapter discloses a brief explanation on the research project entitled of the features of remote controller system for High Volume Low Speed (HVLS) Fan speed. It comprises of project background, project motivation, problem statement, objectives and scope of work.

1.1 Project background

The fast development in industrial innovation has driven the economy to change colossally. New applications in the region of convenient application arose because of the headway in power and control electronics. To be in standard with the ascent of this specific innovation headway, more successful, adaptable and effective electric drive control and electric engines have been made. Modern machines ought to have the drive that appropriate of its application. For Suria Giant Fan Services Sdn. Bhd. (SGFS), they are using Brush-less Direct Current (BLDC) motor as their fan's motor to get their goal achieved. This motor can be worked in single phase, two-phase or three-phase configuration. There are two principle parts of the motor known as stator and rotor which comprise of coil and permanent magnet respectively.

In industry of HVLS fan, they are using BLDC motor as one of their technologies to improve the quality of their production for consumers. The remote control for the BLDC motor is rarely developed especially to control the speed of HVLS fan from the certain distance. For the HVLS fan industry, this remote control system is in high demand from the customers of this company which is one of the well-known companies in HVLS fan industry in Malaysia. SGFS recently uses 2 type of motors which are induction motor (Euro Series) and BLDC motor (Grande Series). These motor are assembled with the analogue controller to operate the motor. The wiring circuit of the HVLS fan of Grande series is shown in Figure 1.1.

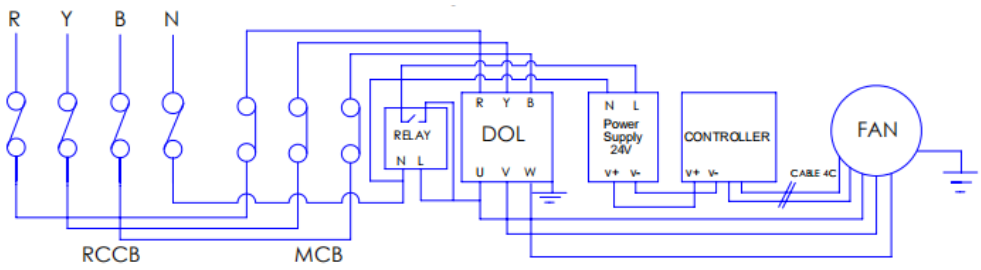

Figure 1.1 Wiring circuit of HVLS fan (Grande Series)

1.2 Project motivation

Remote control system is widely used in many applications such as industrial application, electronic application and other domestic appliances where precise motion control and stable operation are critical for the satisfactory operation of the manufacturing or industrial process. They have their own capabilities to operate some appliances using remote control to facilitate their work and low the risk of accident happens in industries. The high demand from the customers should be full filled by the industry using the latest technology and knowledge.

1.3 Problem statement

BLDC motor has been utilised in industries for various applications where power division and unwavering quality are the primary key elements. SGFS uses this kind of motor because of it has higher electromagnetic torque, contrasted with the standard enlistment of regular DC motor.

The majority of the researchers study about the driver type including circuit plan and driver execution. The researcher likewise focuses to improve torque ripple of motor by changing the current output. In the interim, in term of motor viewpoint, most researchers just emphasize about the HVLS fan structure and execution. The remote control system of HVLS fan has not been invented yet during this time. None of them try to developed remote control system to control the speed of HVLS fan. All of the HVLS fan is using the analogue control that attached at the Main Switch Board (MSB) of the fan.

Furthermore, SGFS receive some request for the remote control to change the speed of the HVLS fan. The customer asked for the remote control system as they having some difficulties to change the speed of the HVLS fan according to the environment temperature. They need to go to the MSB of the HVLS fan in order to on/off and change the speed of the HVLS fan. The problem also happens when the MSB is too far and difficult to achieve which troublesome for the consumers.

Therefore, this project aims to develop the remote controller system for HVLS fan in order to solve the problem faced by the SGFS's customers.

1.4 Objective

Based on problem statement above, several objectives have been identified for this project. The objectives are listed as below:

1. To design and develop remote controller system for HVLS fan by using multiple fixed voltage regulator.
2. To analyse the output DC voltage of existing HVLS controller with the remote controller system.
3. To determine the signal detection distance of IR remote control module.

1.5 Scope of Work

In this project, for the remote controller, it needs to analyse the characteristic which is needed to be exactly similar as the current controller output voltage for the HVLS fan. The controller needs to be assembled and designed specifically to get the industrial approved and change directly the existing controller to this remote controller system. Besides that, this project focuses on the accuracy of the controller change the DC voltage output as control the speed of the HVLS fan. Then comparison will be made between the existing analogue controller and the new controller with the remote integration. Before further measurement, proper circuit design needs to be taken seriously in the simulation study. The calibration of each component needs to be known and be in proper method arrangement before running the experiment to avoid the error of the observing data.

1.6 Thesis outline

This report is composes of five chapters about the development of remote controller system for HVLS fan. Chapter one communicates overview about this project. It incorporates a presentation an introduction of project background, problem statement, scope of work and objectives. Just as the commitment towards this project. Start with clarification in general about project background, including how this project functions and how this project was obtained. Additionally, the problem statements tended to the motivation to do in this project. The objectives show the assurance of point that is needed for this project. Also, the scope of works give a layout about the system and restriction in this exploration.

In chapter two, researches through some articles have been done for the controller circuit and components that might be used in this project. Discussion and observation through all related research papers are compared to this project development. This chapter also identifies some methods to control BLDC motor speed. The block diagram and results from previous research also discussed in this chapter.

Chapter three depicts methodology of the project. A clarification about the general method that utilized by utilizing flow chart and block diagram. Clarification about system flow, software and hardware advancement additionally discussed in this section. Lastly the rundown of components are likewise included and are examined in this section.

Chapter four express all the findings of the project. The development of coding for IR remote controller is done. The coding is depends on the system flow intended to accomplish wanted goal for the system. This section additionally shows the controller circuit that designed and the final result of this project. Some analysis had been done on the simulation DC output voltage produce, comparison between the existing controller of the HVLS fan with this remote controller system and the analysis on detection distance between remote and signal receiver of remote control module used.

Chapter five introduces the outline of the project finding and results analysis which incorporates future work for this project. Other than that, this section likewise incorporates a couple of proposals that can be implemented for this project.

CHAPTER 2

LITERATURE REVIEW

This chapter discusses about the research paper that related to this project. The remote control system operation also has been discussed in this chapter. Comparison of component and system flow have been done to get some ideas and knowledge to succeed this project. There also has some methods discussed in this chapter.

2.1 Background and operation of remote control system

Remote control systems are widely used either at home or in industry to control the operation of certain equipment. A popular use of such devices is to operate ceiling fan, television, gates, light and other electronic appliances. It is particularly desirable to employ a remote control device within the distance to facilitate movement.

Generally, a controller system has a distance transmitter and a recipient coupled to the gadget which is to be controlled. At the point when initiated, the transmitter discharges a modulated signal which is perceived by the beneficiary which at that point initiates the gadget in light of the sent signal. In this Systems, a transmitter normally produces a pulse modulation signal to activate the system. The signal encapsulates a modulation pattern as a sequence of "signal on and "signal off stretches. The balanced Signal discharged by the transmitter is perceived by the recipient [1]

The regulation example of controllers utilized for access to electrical appliances is commonly rearrange the work. For accommodation of utilizing the HVLS fan, it is alluring to include a remote controller system inside to control the speed of the HVLS fan. As of now, this achievement can be accomplished by making a controller to control the speed of the giant fan.

2.2 Ceiling fan control system

An electronic ceiling fan incorporates a fan regulator and a wired controller. The fan regulator additionally incorporates a Printed Circuit Board (PCB) having a remote correspondence module and an electronic circuit combined with the remote correspondence module and is arranged to control the engine to turn the majority of fan edges. The wired controller gadget is coupled to the PCB and is designed to impart the client choice signal to the electronic circuit on a first recurrence.

The electronic circuit is designed to be receptive to signals from the wired controller on the primary recurrence and to be receptive to signals from the remote correspondence module on a subsequent recurrence. Wireless communication module can be configuring by radio frequency, infrared, Bluetooth, Near Field Communication (NFC) or Wi-Fi. Wireless control device used to communicate with the fan controller circuit [2].

For this project, same idea has been implemented using the control circuit and additional wireless communication which is Infrared (IR) Remote Controller that integrated with Arduino. The signal from the wired remote control device also can be pulse width modulated. For the HVLS fan, the input required is in Direct Current (DC) Voltage and then, maintaining the Alternate Current (AC) current from the Direct On Line (DOL) device. The circuit diagram of the HVLS fan shown in Figure 1.1 previously.

2.3 Remote controlled fan regulator

The remote controller works in the accompanying method. A button is pressed. This method finishes a particular associated which delivering a Morse code line signal explicit to that button. The transistor intensifies the signal and sends it to the LED which makes an interpretation of the signal into infrared light. The sensor on the apparatus recognizes the infrared light and responds suitably. The controller's capacity is to trust that the user will press a key and afterward make an interpretation of that action into infrared light signals that are received. The carrier frequency of such infrared signal is regularly around 36 kHz.

Ordinarily, the transmitter part is about the development of the goal that the transmitter oscillator which drives the infrared transmitter LED which can be turned on/off by applying a TTL (Transistor-Transistor Logic) voltage on the adjustment controller info. On the collector side, a transistor or diode takes the signal. The methodology implemented in this study is the measured methodology where the general plan was broken into practical square charts, where each squares consider a segment of the circuit that completes a particular capacity. The system flow was planned utilizing 9 squares, as appeared in the block diagram in Figure 2.3 below [3].

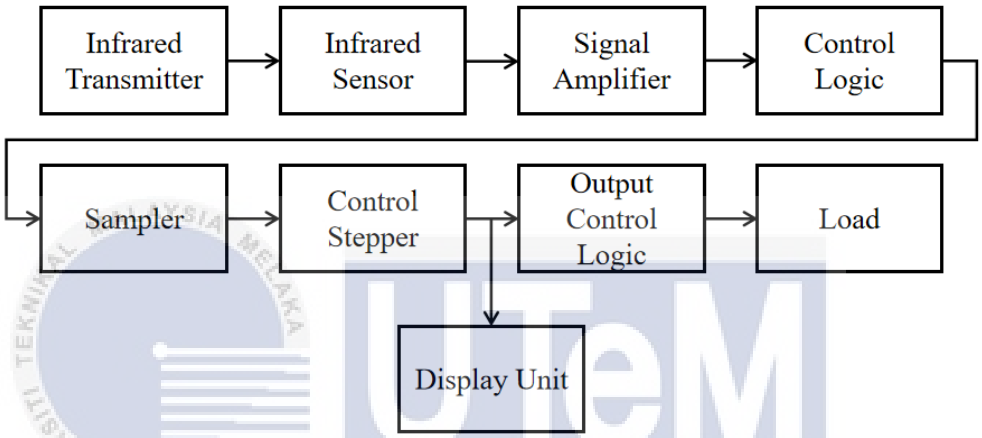

Figure 2.3 Block diagram for remote control fan regulator system

2.3.1 Transmitter

Remote control system need transmitter to send the infrared signal that will received by the infrared sensor. Figure 2.3.1 below shows the example of circuit diagram to understand the mode of operation.

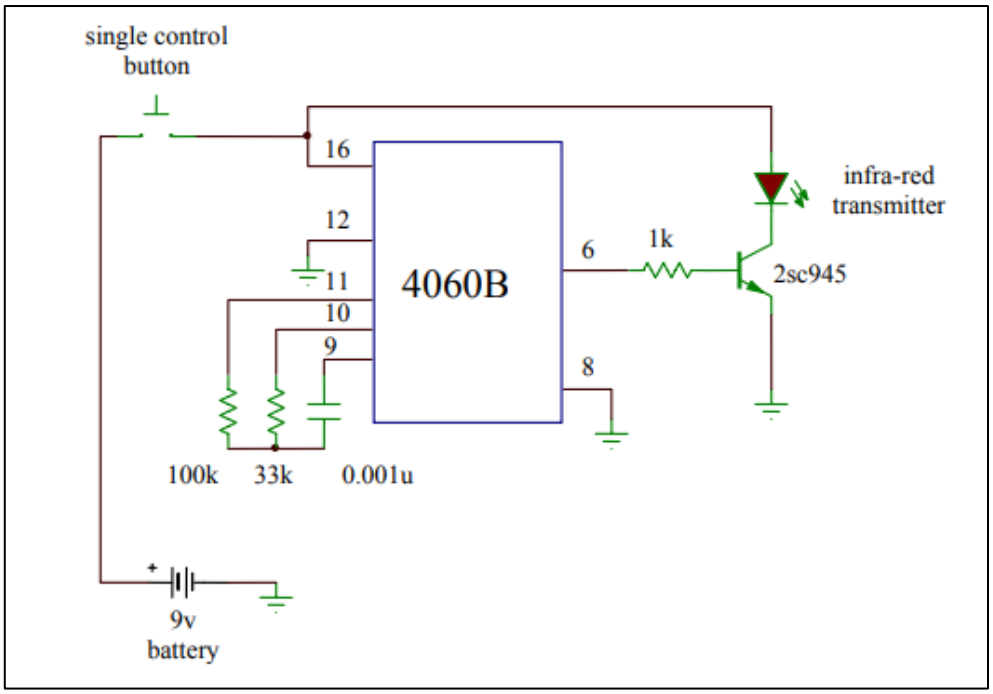

Figure 2.3.1 Example circuit of remote device

Based on Figure 2.3.1, researcher [3] used 9V DC source for the remote control. The 4060B oscillator IC produce high and low signal on pin 6 when the switch is closed which is feed across the base of the 2sc945 NPN transistor. High voltage across the base of NPN transistor occurred while the output of the oscillator is high mode which turn on the transistor. The infrared emitting diode permitted to be grounded and produce the emission of an infrared ray. If the output of oscillator is low, vice versa of the operation will occurred resulting no emission of infrared ray.

For this project, existing transmitter is used based on Arduino module which is integrated with the receiver that will connect to the Arduino. The coding of the system was developed by using Arduino compiler to get the desired system function. Basically the operation is same, while button in remote area is triggered, it will send the data to the receiver based on the programme which has been set.

2.4 Infrared remote control switch

Remote control system is used to switch on/off the home appliances by using standard remote control. The process is controlled by the 8-bit Micro-controller AT89S52. It receives the Infrared Signal from the receiver and decodes the

appropriate appliances. The range is 10 meters which is not compatible with the range of Arduino IR remote controller module in this project.

Researcher [4] used TV remote as the transmitter to send the data to receiver designed which is more effective than the Arduino module. The bit sends and the modulated lengths are same which are (0's and 1's) and 38 KHz infrared signal respectively. Micro-controller used also can control maximum load current of 5 amperes which is not comparable to the Arduino Micro-controller.

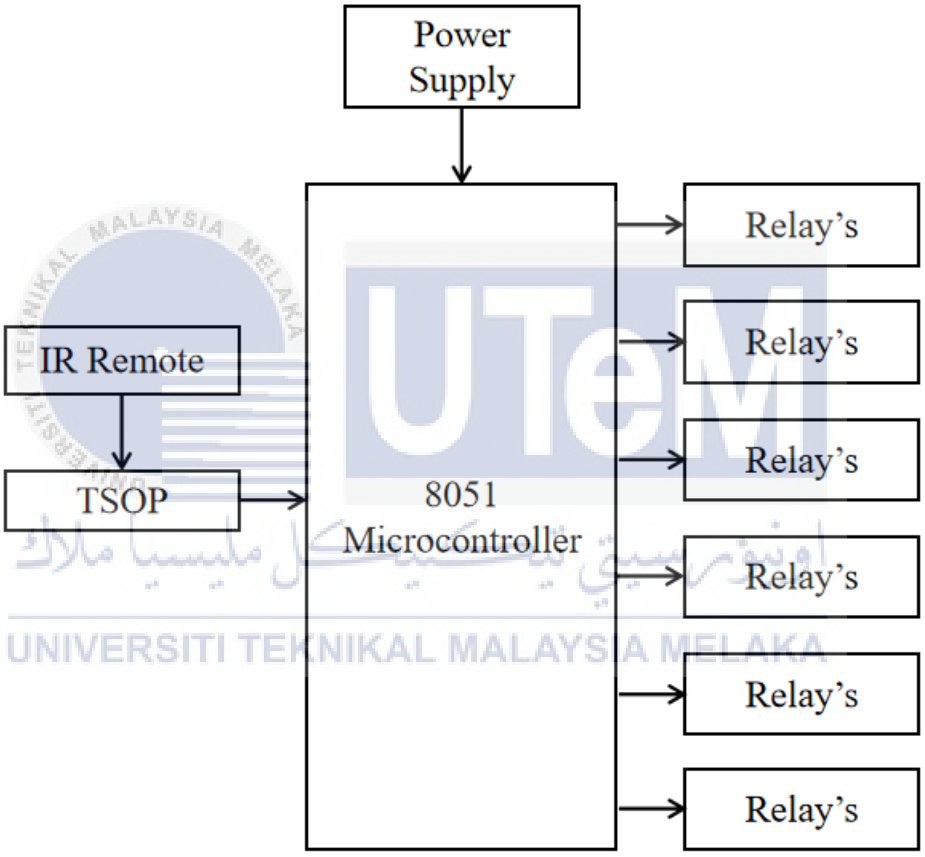

Figure 2.4 Block diagram of infrared remote control switch

Based on Figure 2.4, researcher [4] used TSOP 1763 as the receiver of IR remote controller. For IR decoder, Micro-controller used with the program that decodes RC5 protocol to control the input and output of the system. Relay is used to switch one circuit separately to control the activation of circuit controlled.