CHAPTER 1

INTRODUCTION

1.1 Background of study

The speed of a DC motor can be varied by many methods and one of them is by using Programmable Interface Controller (PIC) to produce Pulse Width Modulation (PWM) signal with variable duty cycle. But, in terms of varying a DC motor speed, there are options of doing it manually or automatically. By manually means that the input data that is to be sent to the microcontroller to determine output voltage supply to the motor by PWM method is determined by the user. But in automatic control to vary a DC motor speed, the input data is not based on online data input from the user, but from programmed code to control the output voltage supply to the motor through PWM by variable input data obtained by sensor interfacing.

This project uses control logic for the DC motor speed control which is based on the ambient temperature readings of an analogue temperature sensor. The microcontroller will produce a PWM signal with variable duty cycle based on the temperature data obtained to regulate the motor speed. A PIC with analogue input and PWM peripheral will be used in this project to communicate with an analogue temperature sensor and to regulate a brushless DC motor (BLDC motor) speed.

1.2 Problem Statement

Generally, temperature controlled DC motor speed is applicable in cooling fan speed control. It is necessary to control the fan speed to reduce noise produced by the fan and improving the fan reliability. The noise levels produced by a cooling fan are in fact can reach 70 dB. Since fan noise increases exponentially to the fan rotation speed, reducing revolutions per minute (RPM) by a small amount potentially means a reduction in fan noise. This must be done cautiously, as excessive reduction in speed may cause components to overheat and be damaged. If done properly fan noise can be drastically reduced. The control of the fan speed is obtained by a closed-loop system, which is using temperature sensor as a feedback of the system. A controlled fan speed in accordance to temperature does as well reduce the power consumption of the fan itself.

1.3 Project Objective

i. Build the hardware that consists of PIC microcontroller, an analogue temperature sensor, N-Channel MOSFET, a 12V BLDC motor, an LCD display to display ambient temperature, and a DC-DC boost converter to boost 9Vdc to 12Vdc to supply the BLDC motor.

ii. Design source code for the PIC programming to interface with the analogue temperature sensor and the LCD display to display ambient temperature reading and such that it meet the required conditions for the BLDC motor speed control based on ambient temperature reading. Another PWM program also required to drive an N-channel MOSFET of the boost converter.

1.4 Project Scope

i. Use PROTEUS ISIS Professional v7.6 SP4 software to design and simulate hardware schematic of PIC microcontroller interfacing with an analogue temperature sensor, LCD display, an N-channel MOSFET and a BLDC motor. Simulation must be done with a complete function of .hex file for the microcontroller.

ii. Use PSpice OrCAD Capture v9.1 software to design and simulate a DC-DC boost converter to boost a 9Vdc supply to 12Vdc.

iii. Use MicroCode Studio 4.0.0 PICBASIC PRO v2.6 to design source code for the PIC and converting the .pbp file to .hex file.

iv. Build the hardware that consists of PIC microcontroller, an analogue temperature sensor, N-Channel MOSFET, a 12V BLDC motor, an LCD display to display ambient temperature, and a DC-DC boost converter to boost 9Vdc supply to 12Vdc.