PC BASED OF MOTORIZED BALL VALVE POSITION

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"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronic and Drive)."

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"I hereby declared that this report entitle " Pc Based of Motorized Ball Valve Position" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree."

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Date : MAY 2009

To my beloved mother and father, Mrs Salasiah Binti Ismail and Mr. Azmi Bin Yahya and family who provided me with love, guidance, enthusiasm, and support emotionally and financially throughout this long journey called my college career. Without them this report could not have been possible.

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In the name of Allah, The Most Gracious, The Most Merciful. Peace be upon the Messenger of Allah, Prophet Muhammad S.A.W, his companions (r.a) and followers until the end day.

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ABSTRACT

This project is to design and develop a motorized valve position using computer interface. The purpose of control the valve is to control flow in the valve .The position of the valve is estimated using timer in visual basic programming and show in the interface using the scrollbar. The technique uses the capabilities of the computer's parallel port to provide an 8-bit input. The scope of this project is to control and upgrade a 2-way motorized ball valve into a multi position motorized ball valve. The software Microsoft Visual Basic is used as user interface.

ABSTRAK

Projek ini adalah untuk merekabentuk dan membangunkan sistem kawalan bebola menggunakan antaramuka computer. Injap kawalan bebola ini digunakan untuk mengawal pengaliran cecair dalam injap. Kawalan injap dikawal dengan menggunakan penentu masa yang terdapat didalam pengatucaraan *visual basic*. dengan menggunakan bar petunjuk. Teknik keupayaan berkomputer digunakan untuk mengawal 8 bit masukan. Skop projek ini adalah untuk meningkatkan kawalan injap 2 arah kepada kawalan boleh ubah. Perisian Microsoft Visual Basic digunakan sebagai antara muka pengguna.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

As technology progressed and the need for greater external connectivity increased, the parallel port became the means by which users could connect higher performance peripherals. In this project, parallel port is used as a medium of interfacing the software and the motorized valve. The reason of using parallel port in this project is because of its maximum data transfer rate which is around 150 kilobytes per seconds and it is extremely software intensive. But it has a distance limitation of only 6 feet for external cables[1].

A valve positioner is a device used to increase or decrease the air pressure operating the actuator until the valve stem reaches the position called for by the instrument controller. Positioners are generally mounted on the side or top of the actuator. They are connected mechanically to the valve stem so that stem position can be compared with the position dictated by the controller. A positioner is a type of air relay which is used between the controller output and the valve diaphragm. The positioner acts to overcome hysteresis, packing box friction, and valve plug unbalance due to pressure drop. It assures exact positioning of the valve stem in accordance with the controller output.

This project is to control the position of 2-way motorized ball valve. It is also to upgrade the 2-way motorized ball valve into a multi position valve. The purpose of control the valve position is to control flow and pressure in the valve. The position of the valve is estimated using timer in visual basic programming and show in the graphical interface using a scrollbar.

This report discusses the design and development of the motorized valve positioner using computer interfacing. The discussion includes software and hardware development. The designing and developing procedure is simplified in the Project Development Flowchart shown in figure 1.1.

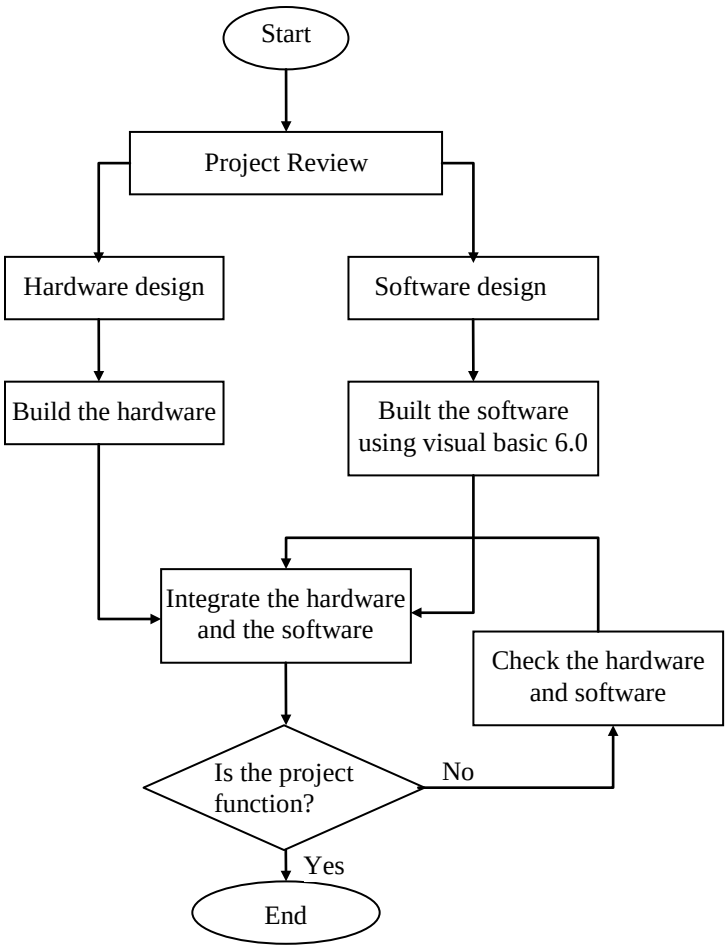

Figure 1.1: Project Development Flowchart.

1.2 Project Overview

The purpose of this project is to design and develop a motorized valve positioner at a lower cost by using Visual Basic 6.0 as user interface and hardware interface. The progresses are divided into two parts. The first part is the valve and the second part is the controller of the valve.

The valve used in this project is a motorized ball valve. PC is used as a controller for the valve. Software is used as user interface and hardware interface. The software used is Visual Basic 6.0. The basic diagram of the motorized valve positioner is shown in figure 1.2.

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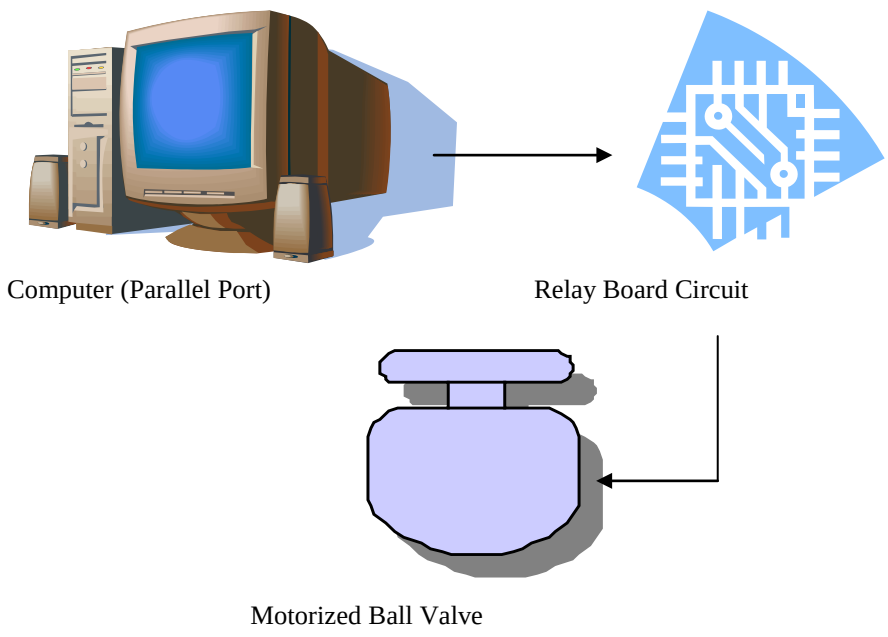

Figure 1.2: Basic Diagram of Motorized Valve Positioner Interfacing.

1.3 Project Objectives

The objectives of this project are as follows:

i) To upgrade a 2-way motorized ball valve into a multi position motorized ball valve.

ii) To estimate the position of the motorized ball valve using timer in Visual Basic 6.0.

iii) To develop a program using Visual Basic 6.0 that will drive the input of the parallel port

iv) To develop a low cost relay board circuit

1.4 Scope

The scope of this project is to control and upgrade a 2-way motorized ball valve into multi position motorized ball using Visual Basic.

1.5 Expected result

The motorized ball valve position control developed in this project is interfaced with VB programming through parallel port and relay board circuit. It is an On/Off controller. The valve can be used to control multi position show in the form using a scrollbar and develop a low cost relay board.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter covers the study on the method used to develop this project. The method used to transmit the data is by using parallel port (parallel communication port) where it is interfaced by using Visual Basic 6.0.

2.2 Projects review

Figure 2.1: Motorized Valve (AE-C Series)

2.2.1 Motorized Valve (AE-C Series)

Description

The AE-C series brass motorized valves are primarily designed to control the flow of water or steam in response to the demand of a controller in zone and fan coil applications. The electric on/off actuator provides a two positions control.

It has spring return function and manual override Tab. Valve's actuator can be installed after valve body has been installed onto pipe. The valves are resistant to high moisture conditions, and feature a removable head. AE Series valves are available for low pressure steam applications.

Table 2.1 Motorized Valve (AE-C Series**)** Specifications

Operating Voltage	220-240VAC50/60Hz
Rated Power	5W
Nominal Pressure	1.6Mpa
Close-off Pressure	0.3Mpa
Applied Media	Chilled water, hot water
Opening and closing time	14s

Figure 2.2: Hydraulic ball valve (AE-D series)

2.2.2 Hydraulic ball valve (AE-D series)

Description

The AE-D series 2-position hydraulic valves are used in domestic and small commercial applications to control the flow of hot and/or cold water or glycol solution up to 50% concentration. These 2-Way valves are designed for ON-OFF control and can be piped for diverting or mixing valve applications for

domestic hot water service, in central heating and/or cooling systems; or for individual room temperature control (fan coil, radiator or convector applications).

Table2.2: Hydraulic ball valve (AE-D series) Specifications

Power supply	220VAC
Power consumption	5VA
Allowed pressure differential	1.6Mpa
Close-off Pressure	1.0Mpa
Media	hot or chilled water
Opening and closing time	14s

2.3 Parallel Port

Parallel port is an inexpensive and yet powerful platform for implementing projects dealing with the control of real world peripherals. The parallel port provides eight TTL outputs, five inputs and four bidirectional leads and it provides a very simple means to use the PC interrupt structure [2]. Parallel port consists of three port addresses; data, status and control port. These addresses are in sequential order. That is, if the data port is at address 0x0378, the corresponding status port is at 0x0379 and the control port is at 0x037a.

2.3.1 Parallel Port Background

When IBM introduced the PC, in 1981, the parallel printer port was included as an alternative to the slower serial port as a means for driving the latest high performance dot matrix printers. The parallel port had the capability to transfer 8 bits of data at time whereas the serial port transmitted one bit at a time. When the PC was introduced, dot matrix printers were the main peripheral that used the parallel port [3].

2.3.2 Parallel Port Overview

The parallel port, as implemented on the PC, consists of a connector with 17 signal lines and 8 ground lines. The signal lines are divided into three groups:

- Control (4 lines)
- Status (5 lines)
- Data (8 lines)

Data register is connected to Data lines, Control register is connected to control lines and Status register is connected to Status lines. The registers are virtually connected to the corresponding lines. So what ever the user write to these registers, will appear in corresponding lines as voltages, Of course, they can measure it with a multimeter. And if there is voltages connect to the parallel port can be read from these registers (with some restrictions)[1] . For example, if the user write '1' to Data register, the line Data0 will be driven to +5v. Therefore, it can be programmatically to turn on and off any of the data lines and Control lines. Figure 2.3 shows the parallel port pin assignments.

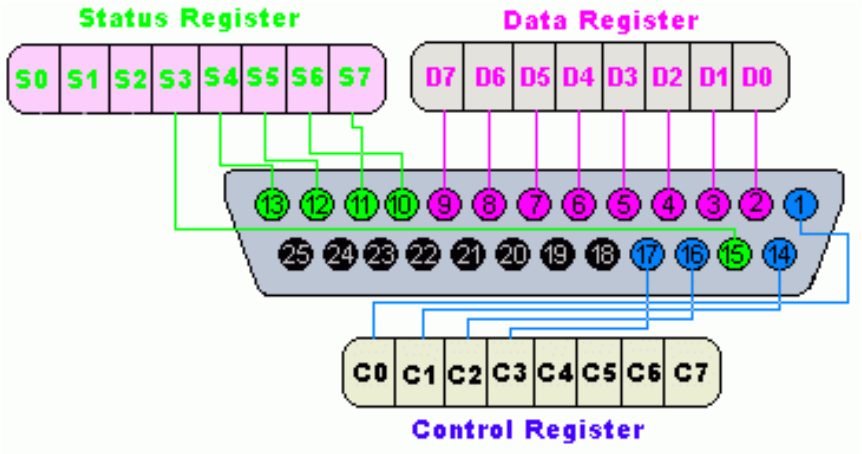

Figure 2.3: Parallel Port (female) Pin.

The details of parallel port signal lines are given in table 2.3 below:

Table 2.3: SPP Signal Definition.

Pin No (DB 25)	Signal Name	Register Bit	Inverted
1	nStrobe	Control-0	Yes
2	Data0	Data-0	No
3	Data1	Data-1	No
4	Data2	Data-2	No
5	Data3	Data-3	No
6	Data4	Data-4	No
7	Data5	Data-5	No
8	Data6	Data-6	No
9	Data7	Data-7	No
10	nAck	Status-6	Yes
11	Busy	Status-7	Yes
12	PaperOut	Status-5	No
13	Select	Status-4	No
14	LineFeed	Control-1	Yes
15	nError	Status-3	No
16	nInitialize	Control-2	No
17	nSelectPrinter	Control-3	Yes
18-25	Ground		

Table 2.3 identifies each of these signals and gives their Standard Parallel Port (SPP) definitions.

- Pin 1 signal is an active low signal which indicates that the valid data is on the data lines.
- Pin 2 until Pin 9 are the data lines.
- Pin 10 is a low asserted pulse used to indicate that the last character was received.
- Pin 11 is a high signal asserted by the printer to indicate that it is busy and cannot take data.
- Pin 12 indicates that paper is empty.
- Pin 13 asserted high to indicate that the printer is online.
- Pin 14 is an active low signal which instructs the printer to automatically insert a line feed for each carriage return.

- Pin 15 is asserted low to indicate that some error condition exists.
- Pin 16 is an active low signal. It is used to reset the printer.
- Pin 17 is an active low signal which is used to indicate to the printer that it is selected.
- Pin 18 until Pin 25 are grounded.

The signals within these groups are assigned to specific bits within the registers that make up the hardware/software interface to the parallel port. The parallel port is mapped into the I/O space of the PC. The registers consist as a contiguous block of 3 registers starting from the parallel port's base address. These ports are commonly referred to as the LPT ports and have the familiar I/O base addresses of 3BCh, 378h and 278h. Newer implementations of the parallel port, that support the advanced modes of IEEE 1284 standard, use 8 to 16 registers and are located at I/O addresses 378h or 278h, or are re-locatable, as in the case of a Plug and Play compliant parallel adapter[3,1].

2.3.3 Connection of The Parallel Port

PC parallel port is 25 pins D-shaped female connector in the back of the computer. It is normally used for connecting computer to printer, but many other types of hardware for that port is available today. Not all 25 are needed always. The pins that usually used are 8 output pins (data lines), input pins (control lines) and signal ground. Those output pins are adequate for many purposes. Those data pins are TTL level output pins. This means that they put out ideally 0V when they are in low logic level (0) and +5V when they are in high logic level (1). In real world the voltages can be something different from ideal when the circuit is loaded. The output current capacity of the parallel port is limited to only few milliamperes.

2.4 Visual Basic 6.0

Visual Basic is one of the most exciting developments in programming for many years. Visual Basic is the next generation of BASIC and is designed to develop user-friendly programs.

Visual Basic Version 6.0 requires the Microsoft Windows operating system. Although we don't need to be an expert user of Microsoft Windows, we do need to know the basics before we can master Visual Basic. We need to be comfortable with manipulating mouse, window and a few short key. However, there is no better way to master Microsoft Windows than to write applications for it and that is what Visual Basic is all about.

2.4.1 Theory on Visual Basic 6.0

Visual Basic is an object-oriented language. It is now one of the most flexible and powerful visual object-oriented computer languages available, and it remains the most popular language. It simplifies window programming. Writing a greeting program with a message 'Hello World' using C programming language can take several lines of instruction. In Visual Basic, however the same program requires only a single line. Visual Basic consists of two types of object which are called forms and controls. These objects can be seen in the Visual Basic start up screen. Figure 2.4 beside shows the Visual Basic 6.0 Start Up Screen.

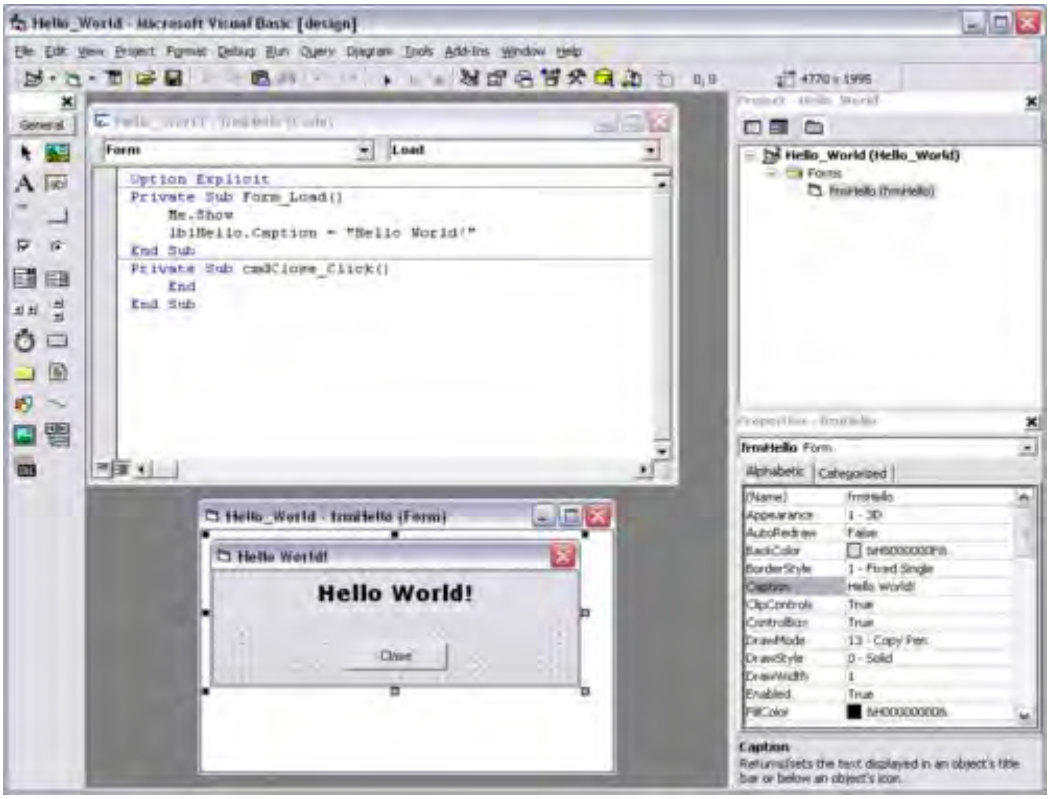

Figure 2.4: Visual Basic Start Up Screen.

Visual Basic was designed to be usable by all programmers, whether novice or expert. The language is designed to make it easy to create simple GUI applications, but can be used to develop fairly complex applications as well. Programming in VB is a combination of visually arranging components on a form, specifying attributes and actions of those components, and possibly writing additional lines of code for more functionality. Since default attributes and actions are defined for the components, a simple program can be created without the programmer having to write many lines of code. Performance problems were experienced by earlier versions, but with faster computers this has become less of an issue[6].

Forms are created using drag and drop techniques. A tools palette is used to place controls (e.g., text boxes, buttons, etc.) on the form (window). Controls have attributes and event handlers associated with them. Default values are provided when the control is created, but may be changed by the programmer.