PC BASED WASHING MACHINE CONTROLLER

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Bekc

2009

"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 (Control, Instrumentation and Automation)"

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This report is submitted in Partial fulfillment of Requirements for the Degree of
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Faculty of Electrical Engineering
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" I hereby declared that this report is a result of my own work expert for the excerpts that have been cited clearly in the references"

Signature   : ……………………………..

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Date   : 08 MAY 2009

Special dedicated to

My beloved parents and siblings, who have encouraged, guided and supported me throughout my study life.

Mr.Ahmad Idil B Abdul Rahman and all my friends,

Thanks for guidance and support...

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ABSTRACT

This project will cover about design and develop a PC based washing machine programming via Microsoft Visual Basic 6.0. This washing machine will able to wash, rinse and spin similar with the other domestic washing machine. This system uses microcontroller as a tool to collect input data, process and release output data. Proteus 6 Professional software used to simulate the microcontroller program. The system will function when microcontroller receive an input signal from the water level sensor, output will take an actions by released base on requirement programmed. The seven-segment is used to display the operation status same as real operation of domestic washing machine. PIC will be used to interface between Washing Machine and Visual Basic and the output from Visual Basic will be transmitted via serial port. While, the output signal from PIC will be transmitted through wiring to the Washing Machine. This machine is control by computer, so it will save time and energy for user to control this machine. Moreover, Visual Basic programming that writes is more it user friendly and the graphics are more interesting. This significant of this programming will help user to control washing machine easily.

ABSTRAK

Projek ini membincangkan berkaitan dengan merekabentuk dan membangunkan mesin basuh yang dikawal oleh PC menggunakan perisian Microsoft *Visual Basic 6.0.* Mesin basuh ini berupaya untuk membasuh, membilas dan mengering sama seperti mesin basuh domestik yang lain. Sistem ini menggunakan pengawalmikro sebagai alat untuk mengumpul data, memproses dan menyalurkan keluaran data. Perisian *Protues 6 Professional* digunakan untuk simulasi program pengawalmikro. Sistem ini akan berfungsi apabila pengawalmikro menerima isyarat masukan daripada pengesan paras air, maka isyarat keluaran bertindak mengikut arahan yang telah diprogramkan. Status operasi cucian dipaparkan oleh paparan tujuh segmen. *PIC* akan digunakan sebagai pengantara muka di antara Mesin Basuh dan *Visual Basic,* dan isyarat daripada *Visual Basic* akan dihantar ke *PIC* melalui pot sesiri. Sementara itu, isyarat dari *PIC* akan dihantar melalui pendawaian ke Mesin Basuh. Tambahan pula, aturcara *Visual Basic* yang dilaksanakan adalah lebih fleksibel untuk menjadikan mesra pengguna dan grafik yang direkabentuk juga adalah menarik. Kepentingan aturcara ini adalah dapat membantu pengguna untuk mengawal mesin basuh ini dengan mudah.

TABLE OF CONTENT

3   **METHODOLOGY**

LIST OF TABLE

LIST OF FIGURE

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1   Introduction

Nowadays the application of washing machine is widely used for consumer. The invention of the washing machine relieved householders of an age-old drudgery-for centuries, clothes had been cleaned by soaking them in stream water and pounding them with rocks. The automatic washing machine was introduced in 1937 by Bendix. A fully automatic Bendix appeared in 1947, the contemporary washing machine offers many options so that the user can tailor the type of washing to the type of garment being washed. For example, the user can select cycles for permanent press, synthetic, or delicate fabrics; a range of temperatures for both wash and spin cycles; length of cycles; and rewash and soak options. Modern washing machines are either front loading or top loading--front loaders wash by tumbling the clothes inside a revolving basket, while top loaders agitate the clothes within the basket.

The technology washing machine becomes more sophisticated. It is because the application the fuzzy logic controls more effective than conventional system. However the application of using microcontroller still important, so this project is become to design the washing machine system using microcontroller and control by computer system.

1.2   Project Overview

This project is to design and develop the PC Based Washing Machine Controller. The tasks are divided into three parts. So, this project consists of three students. The first part is assigned to develop washing machine using microprocessor AT89S51 and design the hardware of project such as motor, buzzer and water level. But for second part is to develop washing machine using microcontroller PIC16F877 and design a coin slot and indicator such as LED and LCD display. For other part is to design a PC based washing machine using microcontroller PIC16F877 and design a water valve and seven-segment display.

In this project, the washing machine is controlled using a computer. The PC as a remote control for washing machine and will be operate when the washing machine received data from PC. The microcontroller is used to collect data from computer and send to the output devices. The output devices will be operated base on requirement programmed in microcontroller. The PC can be controlled the speed for washing machine process system. So, this system can be easier for user to select the speed (low, medium and high) from PC for the washing machine process.

1.3   Objective of Project

This project focuses on the following objective:

1. To build the control system by integrating the software and the hardware.
2. To design and built a control system that can control from other places, so that it can make it affordable for all human.
3. To design and built up automatic washing machine control by PC.

4. To design an output devices such as valve and seven segment for automatic washing machine.

5. To learn about Proteus 6 Professional Software and Visual Basic software.

1.4 Problem Statement

From time to time technology come up and need to upgrade for easier human task. In addition, now a day most of the people are working and they did not have enough time to washing clothes. Therefore, this project is build to be one of the advantages for human to washing clothes from another place. The human can monitor and control the washing machine by PC. Every process in washing machine such as wash, rinse and spin can be control by PC. So, this system can be easier for human to washing clothes without monitor at the washing machine and this system is easier to use.

1.5 Scope of Project

Besides setting up the objectives of the project, the scopes of the project should be setting up earlier. The purpose of setting up the scope of the project from begin the project is because to make sure that the project is done according to the specifications that have been set. If not, the project will be done over the limit of the specifications that have been desired before. The scopes of the project are:

1. Built a circuit for:
    a. Control circuit (microcontroller system)
    b. Serial port circuit (using MAX 232 and PIC 16F877A)
2. Develop program for microcontroller (PIC 16F877 and PIC 16F877A).

3. Simulate the program (using Proteus 6 Professional).
4. Interfacing between serial port circuit and control circuit.
5. Demonstrate the output project using LED, buzzer, seven-segment display, valve and motor.

1.6   Outline of Report

This report consists of 5 chapters where each chapter filled with detail of scope and description. The first chapter is introduction. This chapter discussed about the factors that lead to the development of this project. Besides that, it focuses to the objectives of the project, problem statement and scopes of the project. Second chapter is literature reviews are discussed about the theory of component using and project comparison between previous projects.

Next, the third chapter is methodology. This chapter describe in details about the way of any project is conducted. For this project, the methodology includes of project development for every phases development for every phases starting from the development of small circuit until the testing of every circuit and the completed system. Fourth chapter is result and discussion where these chapters are explanation of the functionality of the completed system, the project planning that has been set from the beginning of the project and the discussion about the problems and constraints that occur during the project development. Next, the last chapter is conclusion where describe the project report briefly. Besides that, this chapter also describes about the recommendation for the problem solution in this project for future improvement that will be done by other people who interested with this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This chapter reviews existing project created to get an idea about the project design, conception and any information that related to improve the project. This chapter also explains and discuss about source or article that related to the project. It is consist of the products that have been appeared in the market nowadays. This chapter is also contained the theory of the components, equipments and programming languages that is used in the project.

2.2 PC Based Robot (AT89C2051)

The advent of new high-speed technology and the growing computer capacity provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drives and advanced control algorithms.

This project describes a new economical solution of robot control systems. The presented robot control system can be used for different sophisticated robot applications. The control system consists of a PC, a microcontroller that collects data from the PC and control the robot.

The intelligent control software, which has been developed using high-level graphical programming language (visual basic). A complete solution of a robot control solution is presented in this project. The robot was fully controlled by the PC and the commands from the PC were received by the microcontroller. The wireless video camera, which was embedded on the robot capture the video and it was transmitted and the image, was viewed over the windows. The robot can be used in military applications [8].

2.3 Fuzzy Optical Sensor for Washing Machine

This paper discussed about the intelligent washing using fuzzy technology which focused on optical sensor. By using fuzzy logic, the wash time was adjusted to laundry dirtiness. Laundry dirtiness was detected by optical sensor, which measured the water transparency.
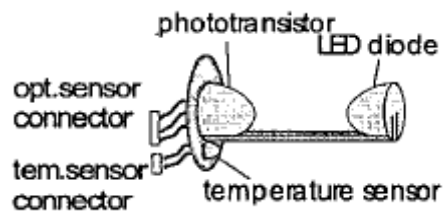

Figure 2.1: Construction Including the Optical and Temperature Sensor

An optical sensor is constituted of the light emitting element (LED diode) and the light receiving element (phototransistor) placed opposite each other. When the output LED diode light intensity is constant, phototransistor emitter voltage shows water transparency. Led diode intensity is controlled by the pulse width of transistor base PWM signal, from the microcontroller. The voltage on sensor emitter resistor is sensor output voltage and connected to microcontroller A/D converter. In that case, the temperature measuring is done by the temperature sensor, which is included in the optical sensor construction above (see figure 2.3).

Figure 2.2: Fuzzy Controller Block Diagram

Fuzzy controller gives correct wash time; it also provides additional washing time to have optimal values for different laundry dirtiness. The decision making capabilities of fuzzy controller are confided in a set of rules. The rules are intuitive and easy to understand, qualitative statements written in English like IF-THEN sentences.

By using the optical sensor, the washing machine becomes "intelligent" because laundry is washed until it is clear and rinsed. In that way, energy saving is achieved and laundry life time is prolonged. Figure 2.4 is show fuzzy controller block diagram.

2.4 Embedded System for Automatic Washing Machine using Microchip PIC18F Series Microcontroller

The design uses the PIC18F series microcontroller. All the control functionalities of the system are built around this. Upgradeability is the unique feature of this system. Control card hardware and software allows the manufacturer to add or remove the features as per customer requirement and model. Thus once the whole system is designed it is very economic in large quantity production. Single-phase motor is considered for the design. Front panel consists of a keypad and LCD display. Keypad provides automatic and manual wash options to the user. LCD display is convenient to convey machine information to user.

One more design possibility is to use brushless DC motors or three phase induction motor. These types of motors are very efficient but requires complex control algorithm. To implement such a complex and real time algorithm dedicated controller and software is required which a master controller controls. Even though cost is important criteria modern washing machines are designed with BLDC motors owing to efficiency and energy conservation. But in this assignment single phase universal motor has been used to design prototype due to its simplicity [9].

2.4.1 Design Specifications

This include both hardware and software specifications.

1. The system should provide fully automatic mode, semi-automatic mode and manual mode. Modes should be selectable by a keypad.
2. Under fully automatic mode user intervention requirement should be zero. Once the system is started in this mode it should perform its work independently and after the completion of work it should notify the user about the completion of work. This mode instantaneously should sense cloth quality

and requirement of water, water temperature, detergent, load, wash cycle time and perform operation accordingly.

3. In semi-automatic mode also user requirement should be nil. But user has to choose any one of the semi-automatic mode in which washing conditions are predefined. Once the predefined mode is started the system should perform its job and after completion it should inform the user.

4. In manual mode continuous intervention of user is required. User has to specify which operation he wants to do and has to provide related information to the control system.

5. The system should provide all basic features of a washing machine like washing, rinsing, spinning, drying, cold wash, hot wash etc.

6. The system should provide easy options for upgradeability of new features. The hardware and the software should be compatible to both machines, which have fewer features, or more features. Removal of any feature should not affect the working of any other features or overall working of the system.

7. The system should work on single phase AC from 190VAC to 250VAC. The system should protect itself from power supply voltage variations.

8. In the event of power failure, the washing machine should automatically start its cycle from the point of interruption when power is resumed.

2.4.2   Hardware Design

Heart of this system is PIC18F452. Most of the peripheral features have been utilized to implement the design. Controlling the motor is very crucial part of the design. The PWM feature of the microcontroller controls motor speed. PWM output is fed to driver circuit and then to motor. To rotate the motor in two different directions 'forward' and 'reverse' direction control blocks are used. Motor speed sensor is interfaced to microcontroller. Microcontroller reads the speed of the motor and appropriately controls the speed of the motor in different phases of washing using PWM output. Door sensor,