EXPRESS SOLE DRYER (ESD)

ABU NAEEM BIN ABDUL BAHAR

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Sesi Pengajian :

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Supervisor's Name : ENGR. KHAIRUL MUZZAMMIL BIN SAIPULLAH

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I’m dedicated this to my family, especially my mother who always supported me. Also to those who are always on my side which is my brother and sisters, my nephews, lectures and all my friends.

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ABSTRACT

Express Sole Dryer (ESD) was designed to replace the use of old floor mat made of cloth. It is placed at the entrance of a place where people will walk and step on it while rub their shoe soles on the surface of the floor mat. Same like the old floor mat, Express Sole Dryer (ESD) created to clean and dry the surface of the shoe sole. Express Sole Dryer (ESD) have benefit like it can dry shoe sole without disturbing user movement. This project aim is to design multipurpose electronic devices based on floor mat application, to combine several of electronics circuit and technology to create cleaning device. It's also help by reduces cost and manpower in the cleaning process. Express Sole Dryer created regarding on embedded system that using electronic component such as PIC, PIR sensor and DC motor to drying sole shoes. It housing originally made from metal that is able to withstand heavy loads making it durable. This project can be commercializes as the main cleaning machine where it can be placed at the front of the main entrance building.

ABSTRAK

Express Sole Dryer telah direka untuk menggantikan penggunaan alas kaki lama yang diperbuat daripada kain. Ianya diletakkan dihadapan pintu masuk di mana orang akan berjalan dan mememijak di atasnya seolah-olah mereka menggosok tapak kasut mereka di atas permukaan alas kaki. Sama seperti alas kaki lama, *Express Sole Dryer* diwujudkan untuk membersihkan dan mengeringkan permukaan tapak kasut. Kelebihan *Express Sole Dryer* adalah ia boleh mengeringkan tapak kasut tanpa mengganggu pergerakan pengguna. Tujuan projek ini adalah untuk mereka bentuk peranti elektronik pelbagai guna berdasarkan aplikasi alas kaki, ianya juga menggabungkan beberapa litar elektronik dan teknologi untuk menghasilkan peranti pembersihan. Ia juga membantu dengan mengurangkan kos dan tenaga manusia dalam proses pembersihan. *Express Sole Dryer* dicipta berhubungkait dengan system terbenam yang menggunakan komponen elektronik seperti PIC, PIR sensor dan *DC motor* untuk pengeringan tapak kasut. Rangka sebenarnya diperbuat daripada logam yang mampu untuk menahan beban berat menjadikannya tahan lasak. Projek ini boleh dikomersilkan sebagai mesin pembersih utama dimana ia diletakkan dihadapan pintu utama bangunan.

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LIST OF AMBREVIATIVES

PIR = Passive infrared

PIC = Programmable Integrated Circuit

EEPROM = Erasable Programmable Read-Only Memory

CMOS = Complementary metal–oxide–semiconductor

ALU = Arithmetic Logic Unit

IR = Infrared

JFET = Junction gate field-effect transistor

DC = Direct current

IC = Integrated Circuit

LED = Light emitting diode

AC = Alternative current

UV = Ultraviolet

PCB = Printed circuit board

D/A = Digital to analog

A/D = Analog to digital

Chapter 1

Introduction

Chapter 1 describes about the introduction of the Final Year Project of Degree. It contains brief explanations of subchapters such as problem statements, objectives, scope of project, and methodology used.

1.1 Introduction of Express Sole Dryer (ESD)

On this day, the development of technology is increasing. This includes the cleaning process which has much new cleaning machinery have been created. For the example are vacuum machines, mopping machines, and others.

Floor mat is one of cleanliness equipment used for drying and cleaning shoe soles before entering an area. It is placed at the entrance of a place where people will walk and step on it while rub their shoe soles on the surface of the floor mat. Among of the floor mat application is to clean and dry the sole of the shoe and in the same time minimize the use of othercleanliness equipment such as vacuum, broom and mop.

From the floor mat applications, Express Sole Dryer (ESD) has been designed to replace the use of old floor mat made of cloth. Same like the old floor mat, Express Sole Dryer (ESD) created to clean and dry the surface of the shoe sole.

These machines operate automatically as it is controlled by a microcontroller system and powered by 12 DC power supply. The advantages of Express Sole Dryer (ESD) from the previous floor mat are, it can dry shoe sole without disturbing user movement. Express Sole Dryer (ESD) will rub user shoe sole automatically while user walks on it. It also can remove water automatically that which has already been absorbed by the floor mat.

1.2 Objective

The objectives of this project are as the following:

a) To design a multipurpose electronic device based on floor mat application.
b) To combine several of electronics circuit and technology to create a cleaning device.
c) To help people or company reduces the cost and manpower in the cleaning process.

1.3 Scope

The scopes of this project are as the following:

a) Using embedded system to design an electronic device for cleaning purpose.
b) This project combines the electronic and mechanical part.
c) Dimension of this project is 65cm x 60cm that suitable for 2 footsteps.
d) As for controlling system, this product use Microcontroller PIC18F4550.
e) This project using PIR motion sensor and water sensor as sensory system.

1.4 Problem Statement

Floor cleaning has become one of the important daily routine. Every floor in the building will become wet and slippery because our shoes leaving a wet shoe print

when we step on water during raining day and cleaning process should be done every time to clean up all the wet shoe print. Apart from the effects of wet shoe print on the floor, it will also invite danger to anyone who stepped on the wet surface as it is feared they will fall and injureddue to slippery. Cleaning processes also require expensive and a lot of manpower as it should be done every time.

For the solution, Express Sole Dryer (ESD) is designed to dry the wet shoe soles. It works automatically where it is programmed to operate in accordance with a specified program. Furthermore, it can reduce the use of manpower and operating costs for cleaning purposes. The machine is placed at the front entrance where user will walk on it and the Express Sole Dryer will carry out the process of drying user shoe sole and prevent wet shoe print spread to all places.

1.5 Project Methodology

This project methodology covers 4 main parts. After the end of each part, there will be a testing to make sure each part is in good condition.

1.5.1 Hardware and Software Analysis

a) Literature review.
b) Study about material.
c) Study about circuit operation.

1.5.2 Circuit Simulation and Program

a) Develop the program simulation using MPLAB software.
b) Construct the circuit simulation using Proteus software.
c) Test simulation using Proteus software.

1.5.3 Hardware and Circuit Design

a) Construct circuit.
b) Built the frame and mechanical part.
c) Each of the circuit and frame will be test.

1.5.4 Combining Hardware and Software

a) Program will be burn in to PIC.
b) Combine the circuit and other component with the frame.
c) Test the hardware according it main function.

CHAPTER 2

LITERATURE REVIEW

Chapter 2 describes on the analysis and review about component and its importance in this project. This chapter discuss about the contents of the PIC applications, PIR sensor, and motor driver.

2.1 PIC18F4550 Microcontroller

There are wide range of microcontrollers are available in the market nowadays. PIC18F4550 is the highest series PIC microcontroller manufactured by the Microchip. It has very good features, which are as below.

a) It has a pin count of 40 which comes in the Dual InLine Package (DIP) which is very helpful for interfacing with Peripheral devices.
b) It is a Nano watt technology, which can decrease the power during the operation by operating in different modes.
c) It supports the USB 2.0 data transfer both low speed as well as High speed.
d) It has a facility of generating the clock internally by operating in internal oscillator mode. Therefore, there is no need of external crystal.
e) It works with the operating frequency from DC to 48MHZ.
f) It contains 32KB of program memory, 2KB of data space, and 256 bytes of EEPROM.

g) It has five I/O Ports (A, B, C, D, and E) of different sizes.

h) It comes with four inbuilt timers and 10 bit Analog to digital converter module.

i) It can be programmed using Assembly as well as C language. [1]

2.1.1 Pin Layout of PIC18F4550

The figure below shows the Pin diagram of PIC18F4550.

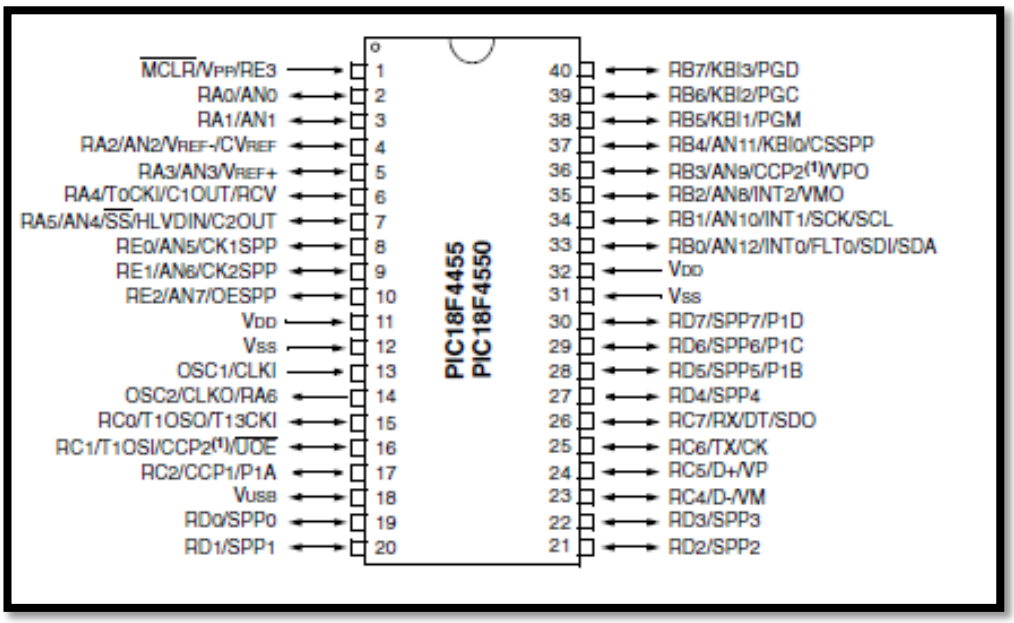

Figure 2.1: Pin Diagram of PIC18F4550 Microcontroller [1]

2.1.2 Pin Description for the PIC18F4550

PIC 18F family has many pins .It has five ports. Each of ports is of variable width. Every port pin can works as analog as well as digital, input as well as output. It has a pin for master clear to reset the controller. It is an input active low signal pin. It defines the voltage level based on CMOS.The implementation of this pin is as below. It is connected to ground through switch. It has also pins for generating

the clock signals. That is, OSC1 and OSC2.Both of these pins are connected to crystal resonator.OSC2 pin can also work as I/O pin.

The operation of oscillator is controlled through two-configuration registers and two control registers. Two configuration registers are CONFIG1L and CONFIG1H and select the oscillator mode and USB Pre scalar or post scalar option. The OSCCON register is selected for active clock mode and is used to control the clock in power-managed mode. The OSCTUNE register is used for trimming the INTRC frequency source. In spite of having the external clock pins, it is also possible to generate an internal clock of 8 MHZ by setting up the internal configuration. Internal oscillator block of PIC 18F4550 generates the two clocks out of both anyone can be used to provide the clock to the source.

Apart from the oscillator pins, it has Port A of 6 pins, Port B of 8 pins, Port C of 7 pins, Port D of 8 pins, and Port E of three pins. Each Port has three Special function registers (SFR) associated with it. Designation for them is TRISX, PORTX, and LATX where X can be any port out of five ports. Every Port pin is multiplexed internally to betreated for different functions. The main speciality of PIC is to access a single port pin of any Port and do the operation on that. [1]

Pin No.	Name	Description	Alternate Function
1	MCLR/VPP/RE3	Master clear	Vpp: programming voltage input RE3: I/O pin of PORTE, PIN 3
2	RA0/AN0	PortA I/O Pins 1-6	AN0: Analog input 0
3	RA1/AN1		AN1: Analog input 1
4	RA2/AN2/VREF-/CVREF		AN2: Analog input 2 VREF-: A/D reference voltage (low) input. CVREF: Analog comparator reference output.
5	RA3/AN3/VREF+		AN3: Analog input3 VREF+: A/D reference voltage (high) input
6	RA4/T0CKI/C1OUT/RCV		T0CKI: Timer0 external clock input. C1OUT: Comparator 1 output RCV:External USB transceiver RCV input.
7	RA5/AN4/SS/HLVDIN/C2OUT		AN4: Analog input 4 SS: SPI slave select input HLDVIN: High/Low-Voltage Detect input. C2OUT: Comparator 2 output.
8	RE0/AN5/CK1SPP	PortE I/O Pins 1-3	AN5: Analog input 5 CK1SPP: SPP clock 1 output.
9	RE1/AN6/CK2SPP		AN6: Analog input 6 CK2SPP: SPP clock 2 output
10	RE2/AN7/OESPP		AN6: Analog input 7 OESPP : SPP Enabled output
11	V_{DD}	Positive supply	
12	Vss	Ground	
13	OSC1/CLKI	Oscillator pin 1	CLKI: External clock source input
14	OSC2/CLKO/RA6	PortE I/O Pin 7	CLKO: External clock source output OSC2: Oscillator pin 2
15	RC0/T1OSO/T13CKI	PortC I/O Pins 1-3	T1OSO :Timer1 oscillator output T13CKI: Timer1/Timer3 external clock input.
16	RC1/T1OSI/CCP2/UOE		T1OSI: Timer1 oscillator output CCP2:Capture 2 input/Compare 2 output/PWM2 output UOE: External USB transceiver OE output
17	RC2/CCP1/P1A		CCP1: Capture 1 input/Compare 1 output/PWM1 output. P1A :Enhanced CCP1 PWM output, channel A.
18	VUSB	Internal USB 3.3V voltage regulator output, positive supply for the USB transceiver.	
19	RD0/SPP0	PortD I/O Pins 1-4	SPP0-SPP4 Streaming Parallel Port data
20	RD1/SPP1		
21	RD2/SPP2		
22	RD3/SPP3		
23	RC3/D-/VM	PortC I/O Pins 4-5	D-: USB differential minus line (input/output) VM: External USB transceiver VM input.
24	RC4/D+/VP		D+: USB differential plus line (input/output). VP: External USB transceiver VP input.
25	RC6/TX/CK	PortC I/O Pins 7-8	TX: EUSART asynchronous transmit. CK: EUSART synchronous clock (see RX/DT).
26	RC7/RX/DT/SDO		RX: EUSART asynchronous receive. DT: EUSART synchronous data (see TX/CK). SDO: SPI data out.
27	RD4/SPP4	PortD I/O Pins 5-8	SPP4:Streaming Parallel Port data
28	RD5/SPP5/P1B		SPP5:Streaming Parallel Port data P1B: Enhanced CCP1 PWM output, channel B
29	RD6/SPP6/P1C		SPP6:Streaming Parallel Port data P1C: Enhanced CCP1 PWM output, channel C
30	RD7/SPP7/P1D		SPP7:Streaming Parallel Port data P1D: Enhanced CCP1 PWM output, channel D
31	Vss	Ground	
32	V_{DD}	Positive supply	
33	RB0/AN12/INT0/FLT0/SDI/SDA	PortB I/O Pins 1-8	AN12: Analog input 12. INT0: External interrupt 0. FLT0: Enhanced PWM Fault input (ECCP1 module). SDI: SPI data in. SDA: I^2C data I/O.
34	RB1/AN10/INT1/SCK/SCL		AN10: Analog input 10. INT1: External interrupt 1. SCK: Synchronous serial clock input/output for SPI mode. SCL: Synchronous serial clock input/output for I2C mode.
35	RB2/AN8/INT2/VMO		AN8: Analog input 8. INT2: External interrupt 2. VMO: External USB transceiver VMO output.
36	RB3/AN9/CCP2/VPO		AN9: Analog input 9. CCP2: Capture 2 input/Compare 2 output/PWM2 output. VPO: External USB transceiver VPO output.
37	RB4/AN11/KBI0/CSSPP		AN11: Analog input 11. KBI0: Interrupt-on-change pin. CSSPP: SPP chip select control output.
38	RB5/KBI1/PGM		KBI1: Interrupt-on-change pin. PGM: Low-Voltage ICSP Programming enable pin.
39	RB6/KBI2/PGC		KBI2: Interrupt-on-change pin. PGC: Low-Voltage ICSP Programming enable pin.
40	RB7/KBI3/PGD		KBI3: Interrupt-on-change pin. PGD: In-Circuit Debugger and ICSP programming data pin.

Figure 2.2: Pin description table[1]