IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)
e-ISSN: 2278-1676,p-ISSN: 2320-3331, Volume 11, Issue 3 Ver. II (May. – Jun. 2016), PP 40-45
www.iosrjournals.org

A Model on Programmable Touch Screen Based DC Motor Speed Control - Design and Implementation

Mohammad Aman Ullah
Assistant Professor,
Department of Computer Science and Engineering, International Islamic University Chittagong, Bangladesh.

Abstract: *Now a days, touch screen based home appliance and digital electronic equipment control becomes one of the major research issues. Basically, touch screen allows the equipments to be controlled so easily than that of the manual switching system. Considering the ongoing demands of this technology in electrical and electronic equipment, this research aims at providing a concise idea and design of touch screen based technology to control the speed of the DC MOTOR using the programmable system on chip (PSOC) micro-controller. In this research, we have used resistive touch screen based technology because of its widespread acceptance and as a tool to rescue a person from the danger of electric shock with conventional switches. The purpose of this research is also to provide a framework for Programmable Touch screen based DC Motor speed control. The methodology we adopted was based on grouping of micro-controller with touch screen. In controlling the speed of the motor, varying average voltage was sent to the motor by switching the motor supply on and off very quickly using Pulse Width Modulation (PWM) technique. Our proposed system contributes in more accurate speed control, is safer, reduce unwanted power loss, Finally improves the switching efficiency.*

Keywords: *DC Motor, LCD Display, PSOC, PWM.*

I. Introduction

Now a days, touch screen based home appliance and digital electronic equipment control becomes one of the major research issues. Basically, touch screen allows the equipments to be controlled so easily than that of the manual switching system. A user are now able to process their instructions to a machine with a easy or multi-touch gestures.[1] Research shows that, the touch screen gives better operator mobility when producing similar manipulation performance. [2] All of the above discussed opportunity motivate us to incorporate Four-wire resistive touch screen technology (i.e., to find out both the X and Y coordinates, It uses upper and lower layers of the touchscreen "sandwich" [3]) in controlling the DC motor's speed with the use of PIC16F876A micro-controller to provide the user with a easy touch in using the motors. To control motor speed some research has been done by the researcher, but their research is far different from the model we have proposed and implemented. Krunal patel et al. [4] proposed a system to control the heavy load crane with the use of touch screen. They have done so with use of HMI (Human Machine Interface) and PLC (Programmable Logic Controller) on Drive and AC motor and got better control.

M.Pragna et al. [5] developed a touch screen based system to control the accelerometer based motor speed and direction of robot using arduino. They have applied the PWD technique along with two microcontroller and achieve a measurable performance. An idea to incorporate touch screen to control the speed of the single phase induction motor was provided by Sarat Kumar Sahoo et. al. [6], where they have used PSOC microcontroller to reduce space consumption and ensure easinessof design.Their work assume remote control to control speed of the AC motor. But, with the use of the our proposed model, user could easily control the speed of the motor to get desired output as the system we proposed is programmable. Also, our proposed system aim at more accurate speed control, is safer, reduce unwanted power loss, improve the switching efficiency, finally improve the system accuracy.

The following sections are organized as follows: proposed architecture, implementation requirements, Intemented Circuit diagram, programming of Micro- Controller and finally result and conclusion section.

II. System Architecture

As stated earliar, the purpose of this paper is to control the speed of the DC motor using touch screen. To do so, we have divided our proposed model into two parts such as controller option and RPM section as in Fig. 1. We use resistive touch screen as input device and fed the input to the microcontroller. The output of microcontroller is then fed to Driver to amplify the motor speed and send to the RPM section. To measure motor RPM we have used optical encoder and then we have amplified output using two amplifier. We have then use the TTL converter to remove the DC offset voltage.

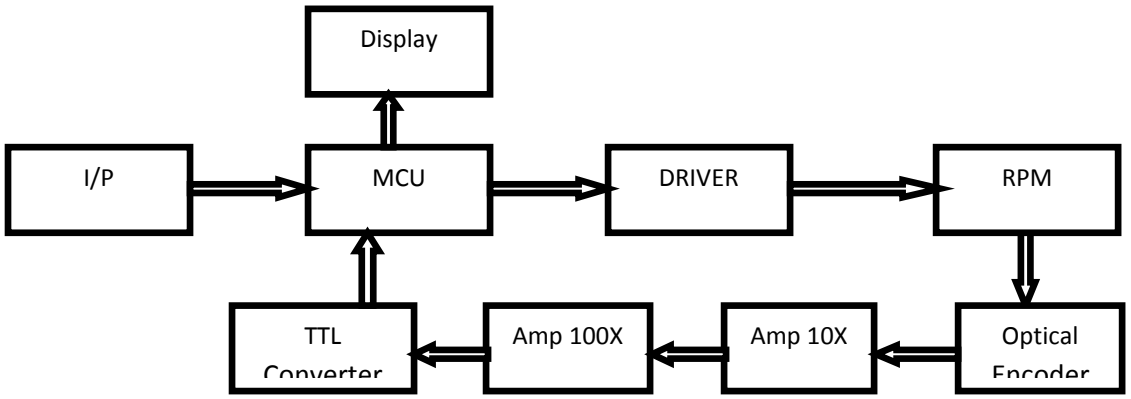

Figure 1: Block Diagram.

III. Implementation

The various kinds of components used in this project are: Touch screen, DC motor, micro-controller, power supply, Crystal Oscillator, Transistor, Freewheeling Diode, LCD display. Some brief description of key terms are given below:

1. Touch Screen

Touch screens are the sheets that could sense the touch on its surface and act accordingly. There are different types of touchscreen technologies available such as Capacitive and Resistive [7]. But, in this research we have used resistive Touch screen.

2. Four Wire Resistive Touch screens

Resistive touchscreens are defined as touch-sensitive displays make up of two elastic sheets covered with a resistive material and divided by the microdots [1]. Resistive touchscreen offer better pointing precision than the capacitive touchscreen and are of low cost [8] and support Multi-touch inputs [9]. We have used Four-wire resistive touch screen technology, but consider only X direction ignoring Y direction as Four wire resistive touch screen available in mobile phone use decode IC, which are very small in size to accommodate in our work.

3. TTL Converter

In transistor–transistor logic (TTL) functions such as logic gating and the amplifying are done by transistors, so as it is called TTL. TTL is widely used in industrial controls, and consumer electronics, etc. In our project we have used TTL as -compatible logic levels (i.e., the corresponding input label to output label of DC Motor) [10].

4. Circuit Description

The main function of the circuit in Fig. 2 is to run the motor by manipulating the speed of the motor to get the desired output. To do so we use a device call touché screen. Our implementation circuit also consists of two separate parts as proposed in Fig. 1 such as controller option and RPM part. Resistive touch screen as serving as input device in our system. By processing the inputs received by the resistive touch screen are then sent to Micocontroller Unit (MCU). We have used PIC16F628A microcontroller in our research. Also used the 10 bit microcontroller ADC in the implemented circuit. The dc motor speed were increase and decrease by input option. We have used the PWM technique to increase and decrease the motor speed. Some times it is difficult to control the motor speed accurately by PWM so we have used motor driver as amplifier. And to measure the motor RPM we have used the optical encoder. To boost up the output we have used two amplifier that could amplify in multiply of 10 K and 100 K. Finally, Implemented circuit is enriched with the capability of removing the DC offset voltage using TTL converter. The prototype of our work is illustrated in Fig. 3.

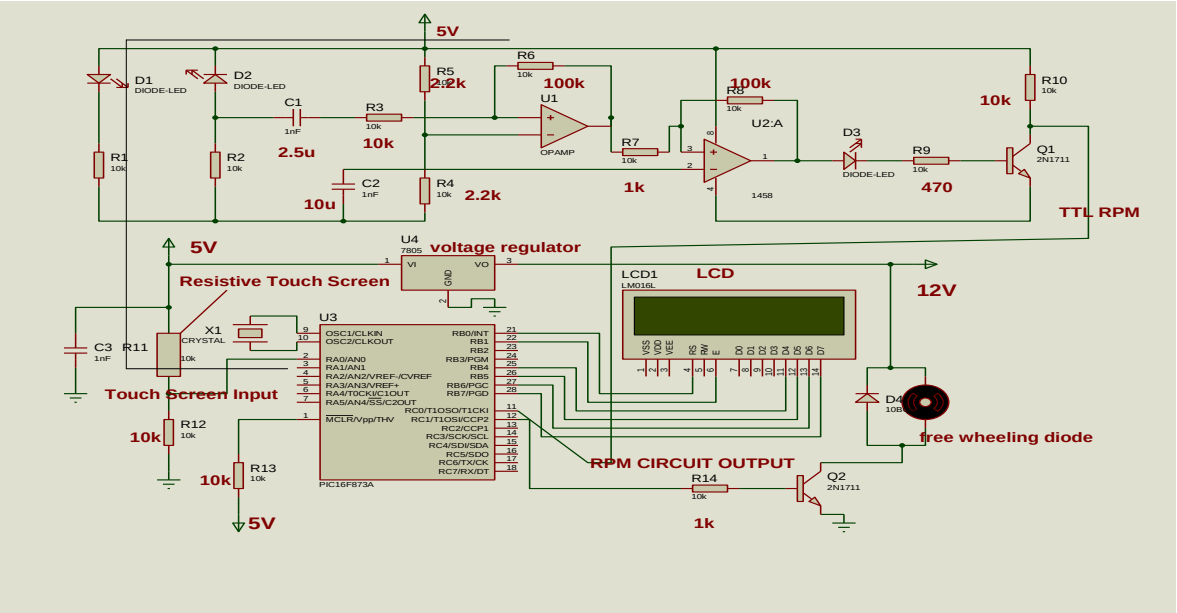

Figure 2: Circuit arrangement**.**

5. Programming the microcontroller

The program is written in 'PIC BASIC' language and compiled using PIC basic compiler. The source program is led into hex code by the compiler. Burn this hex code into PIC16F628A microcontroller. The source program is well commented and easy to understand. First include the register name defined specifically for PIC16F628A and also declare the variable. Set port A as the input and port B as the output. The program will run forever by using 'while' loop. Under 'while' loop, read port A and test the received input using 'switch' statement. The corresponding data will output at port B. The change of the motor speed in RPM in corresponds to touch screen positions are illustrated in TABLE 1.

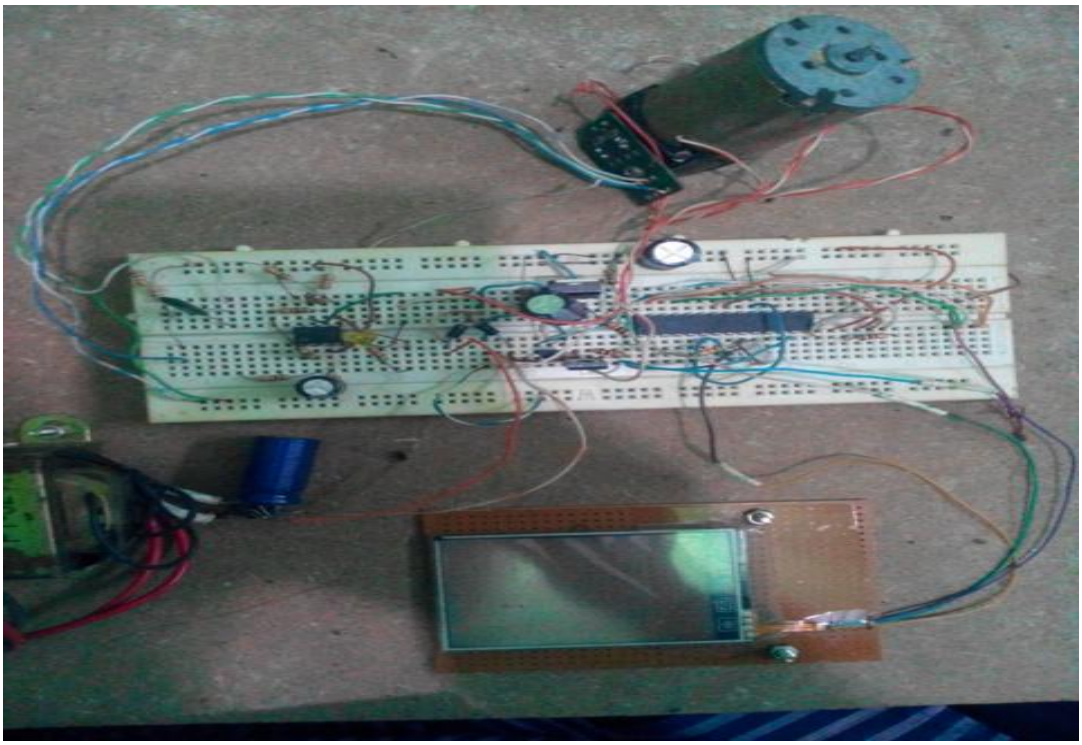

Figure 3: Prototype of the Project.

Implementation code is given below:

```
"PIC16F876A
Define CONF_WORD = %01111100110010
Define CLOCK_FREQUENCY = 4
TRISA = 255
TRISB = 0
TRISC = 240

Define LCD_BITS = 4
Define LCD_DREG = RB
Define LCD_DBIT = 4
Define LCD_RSREG = RB
Define LCD_RSBIT = 0
Define LCD_EREG = RB
Define LCD_EBIT = 1
Lcdinit 0
RC = 0

Dim a As Word
Dim sp As Byte
Dim x As Word
Dim y As Long
    Lcdcmdout LcdClear
    Lcdout " Inter. Islamic "
    Lcdcmdout LcdLine2Home
    Lcdout " University Ctg"
WaitMs 3000
    Lcdcmdout LcdClear
    Lcdout "  Dept. of EEE"
    Lcdcmdout LcdLine2Home
    Lcdout "  "
RC = 1
WaitMs 3000
sp = 0
a = 0
Goto run
main:
    For x = 0 To 250
            Adcin 0, a
            If a > 40 Then
                    WaitMs 150
                    Adcin 0, a
                    If a > 40 Then Goto run
            Endif
            WaitMs 10
    Next x

    RC0 = 1
    If sp > 0 Then Goto rpm
    RC0 = 0
Goto main

run:
    If a > 160 Then
            If sp = 9 Then sp = 8
            sp = sp + 1
    Else
            If sp = 0 Then sp = 1
            sp = sp - 1
```

```
    Endif

    If sp = 0 Then
        Lcdcmdout LcdClear
        Lcdout "   Motor off"

        PWMoff 1
        RC2 = 0
    Endif
    If sp > 0 Then
        PWMon 1, 9
        Lcdcmdout LcdLine1Clear
        Lcdout "  Motor speed ", #sp
        If sp = 1 Then PWMduty 1, 80
        If sp = 2 Then PWMduty 1, 95
        If sp = 3 Then PWMduty 1, 110
        If sp = 4 Then PWMduty 1, 125
        If sp = 5 Then PWMduty 1, 140
        If sp = 6 Then PWMduty 1, 155
        If sp = 7 Then PWMduty 1, 170
        If sp = 8 Then PWMduty 1, 185
        If sp = 9 Then PWMduty 1, 200
    Endif

    WaitMs 300
    Goto main
rpm:
    RC0 = 1
    Count RC4, 1000, x
    y = x * 60
    x = y / 24
    Lcdcmdout LcdLine2Clear
    Lcdout " Motor RPM :", #x
    RC0 = 0
Goto main
```

Touch Screen Position	Speed in RPM
1	80
2	95
3	110
4	125
5	140
6	155
7	170
8	185
9	200

Table 1: Touch Screen Positions

IV. Result And Conclusions

With reprogramming capability, our system allows the users to easily control the speed of the motor to get desired output . Also, it facilitates more accurate speed control, is safer, reduce unwanted power loss, improve the switching efficiency, finally improve the system accuracy. The most notable contribution of this work is the compatibility of the model we have proposed, i.e., it could be applied to all similar electronic equipments. It is easy to operate and free from danger of electric shock as with conventional switching system. The power consumption as well as cost of this projects is also less than that of previous work done by many researcher. The reliability of the system is also remarkable and it is easily expandable by future researchers.

References

[1] G. Walker, "A review of technologies for sensing contact location on the surface of a display," Journal of the Society for Information Display, 20,2012, 413-440.

[2] Kivila, A. "Human operator studies of portable touchscreen crane control interfaces", Industrial Technology (ICIT), IEEE International Conference on 25-28 Feb. 2013, 88 – 93.
[3] "Compare the Resistive Touch screen, "http://www.elotouch.com/Technologies/compare_resist.asp accessed on 7-5-2016
[4] Krunal patel et al. "Touch screen based industrial crane controlling", International Journal of Scientific Research Engineering & Technology (IJSRET), *3 (1),* 2014, 57-58.
[5] M.Pragna, K.S.Roy, Mahaboob Ali, "Touch Screen And Accelerometer Based Wireless Motor Speed And Direction Controlling System Using Arduino", International Journal of Engineering Trends and Technology (IJETT), *4 (4),* 2013, 1253.
[6] Sarat Kumar Sahoo et. al., "Touch Screen based Speed Control of Single Phase Induction Motor". International Journal of Engineering and Technology. *2 (6),* 2010, 392-396.
[7] Andrew Sears, Catherine Plaisant, Ben Shneiderman. A new era for high-precision touchscreens. (In Hartson, R. & Hix, D. Advances in Human-Computer Interaction : Ablex, 1992).
[8] Lee, David,"Capacitive vs. Resistive Touchscreens". R-Tools Technology, Inc. 28 December 2010, Accessed on 7-5-2016.
[9] Paul Miller, "Stantum's mind-blowing multitouch interface on video!". 19 Feb 2009.Accessed on 7-5-2016
[10] Eren, H., Electronic Portable Instruments: Design and Applications, (CRC Press, 2003).