Calculator using Arduino and Push buttons

R Rohith Reddy[†] and G V V Sharma[*]

1 Objective

To make a simple calculator using Arduino where input is given through 4x4 keypad made of push buttons and display the whole operation on a 16x2 LCD display.

2 Components Required

1) Resistor-220Ohm
2) Arduino Uno board
3) 16x2 LCD display
4) 16 Push buttons
5) Jumper wires

3 Introduction

3.1 Arduino UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.

3.2 4x4 Keypad

A keypad is a set of buttons arranged in a block or pad which bear digits, symbols or alphabetical letters.The 4*4 matrix keypad usually is used as input in a project. It has 16 keys in total, which means the same input values.

*The author is with the Department of Electrical Engineering, Indian Institute of Technology, Hyderabad 502285 India e-mail: gadepall@iith.ac.in. † The author was an intern at IIT Hyderabad in the summer of 2017 e-mail: rohithreddy0087@gmail.com
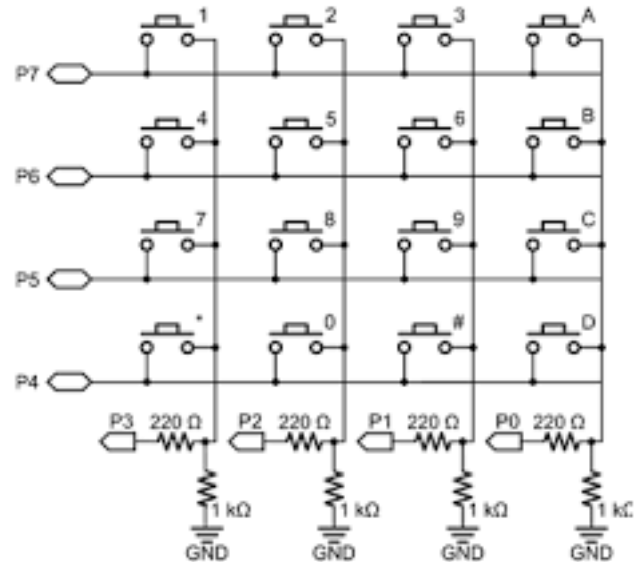

Fig. 1: 4x4 keypad matrix using push buttons

Fig. 2: 4x4 Keypad

3.3 16x2 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications.A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.

4 Hardware Setup

4.1 Push buttons to Arduino connections

1) Connect the 16 push buttons on the bread board in a 4x4 matrix type and assume a value for each push button.
2) Using connecting wires/jumpers connect the 16 push buttons as shown in the Figure 1.
3) Connect the column wires to D0,D1,D6,D7 pins of aurdino and the row wires to D8,D9,D10,D13 of the arduino.
4) Note:In this calculator the push buttons are given following values/characters:

'0' '1' '2' '3'

'4' '5' '6' '7'

'8' '9' '=' '.'

'+' '-' '*' '/'

4.2 LCD to Arduino connections

1) Connect the 5V pin of the Arduino to an extreme pin of the Breadboard shown in Fig. 1. Let this pin be Vcc.
2) Connect the GND pin of the Arduino to the opposite extreme pin of the Breadboard.
3) Connect the arduino to the computer so that it is powered.
4) Plug the LCD in Figure 3 to the bread-board.
5) Connect the 220Ω resistance from Vcc to pin 15 (Led+) of the LCD.
6) Connect the Arduino pins to LCD pins as per Figure 4.

5 Programming of Arduino

Dump the following code in Arduino using its IDE.

https://github.com/rohithreddy0087/Calculator-using-Arduino/blob/master/code./Arduino code

6 Specifications of Calculator

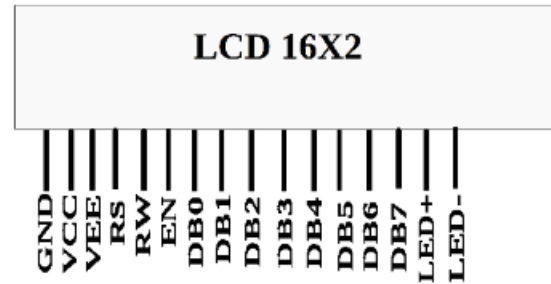1) Any number of inputs can be given to the calculator with any operations between the operands.

Fig. 3: LCD pin out

Arduino Pins	LCD Pins	LCD Pin Label	LCD Pin Description
GND	1	GND	
5V	2	Vcc	
GND	3	Vee	Contrast
D12	4	RS	Register Select
GND	5	R/W	Read/Write
D11	6	EN	Enable
D5	11	DB4	Serial Connection
D4	12	DB5	Serial Connection
D3	13	DB6	Serial Connection
D2	14	DB7	Serial Connection
5V	15	LED+	Backlight
GND	16	LED-	Backlight

Fig. 4: Arduino to LCD Pin Connection

2) The input can be a decimal number also and can be a n digit number.
3) If more than two inputs is given,it performs calculation of first two operands and the obtained result is used for next calculation with third operand and so on.
   For example if 2+3*4 is given it first adds 2+3=5 and this 5 is multiplied to 4 and the final result will be shown as 20.
4) The result of the given input calculation along with the calculation entered is displayed on the LCD display for 4s.After 4s we can enter new calculation.