ICT 5307: Embedded System Design

Lecture 4
Inputting data

Professor S.M. Lutful Kabir

IICT, BUET

An Example of Inputting Data

- Two push button switches (Switch 2 and Switch 1) are connected to Pin 2 and 3 of PORT D of the ATmega32 chip respectively [A '0' appears at the corresponding pin when a Switch is pressed].
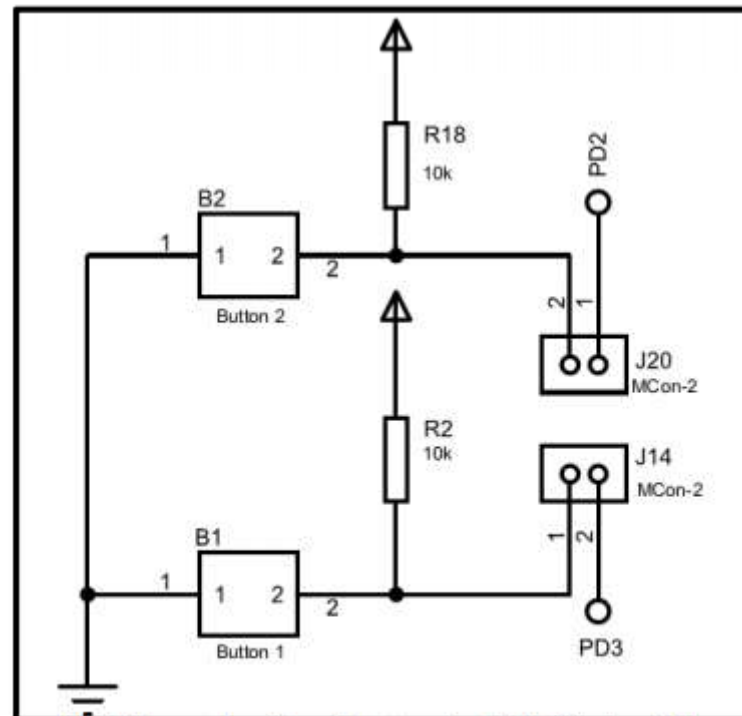
Fig:Schematic of push button in AVR Trainer Kit

A program on INPUTTING data

- By configuring the PD.2 and PD.3 as input pins.
- Configure LCD as follows
  - RS, RD and EN line are connected to PD.4, PD.5 and PD.5 respectively
  - D4-D7 are connected to PC.4-PC.7
- PIND.2 is read and if it is 0, send the string "Button#2" in the LCD.
- PIND.3 is read and if it is 0, send the string "Button#1" in the LCD.
- If none of then is pressed send the string :Press??" in the LCD.
- Write a C code for the above mentioned input and output

The Code

```
while (1)
    {
      if (PIND.2==0)
        {
            lcd_clear();
            lcd_putsf("Button#2");

        }
      if (PIND.3==0)
        {

            lcd_clear();
            lcd_putsf("Button#1");

        }
      if (PIND.2==1&&PIND.3==1)
        {

            lcd_clear();
            lcd_putsf("Press??");

        }
    }
```

Keypad Interfacing

- Keypads and LCDs are the most widely used input/output devices in microcontrollers such as the AVR.

- We shall discuss keypad fundamentals, key pressed and key detection mechanism.

- At the lowest level, keypads are organized in a matrix of rows and columns.

- The CPU accesses both the rows and columns through ports.

- Therefore, with a 8-bit ports, an 4X4 keypad can be connected to a microcontroller.

Keypad in a Matrix

- Figure shows 16 key interfaced using one port.

- The rows are connected to lower 4 pins of port A and the columns are connected to upper 4 pins of the same port.

- If no key has been pressed and rows are read, all rows will be read as '1' since VCC is connected to the rows through resistors
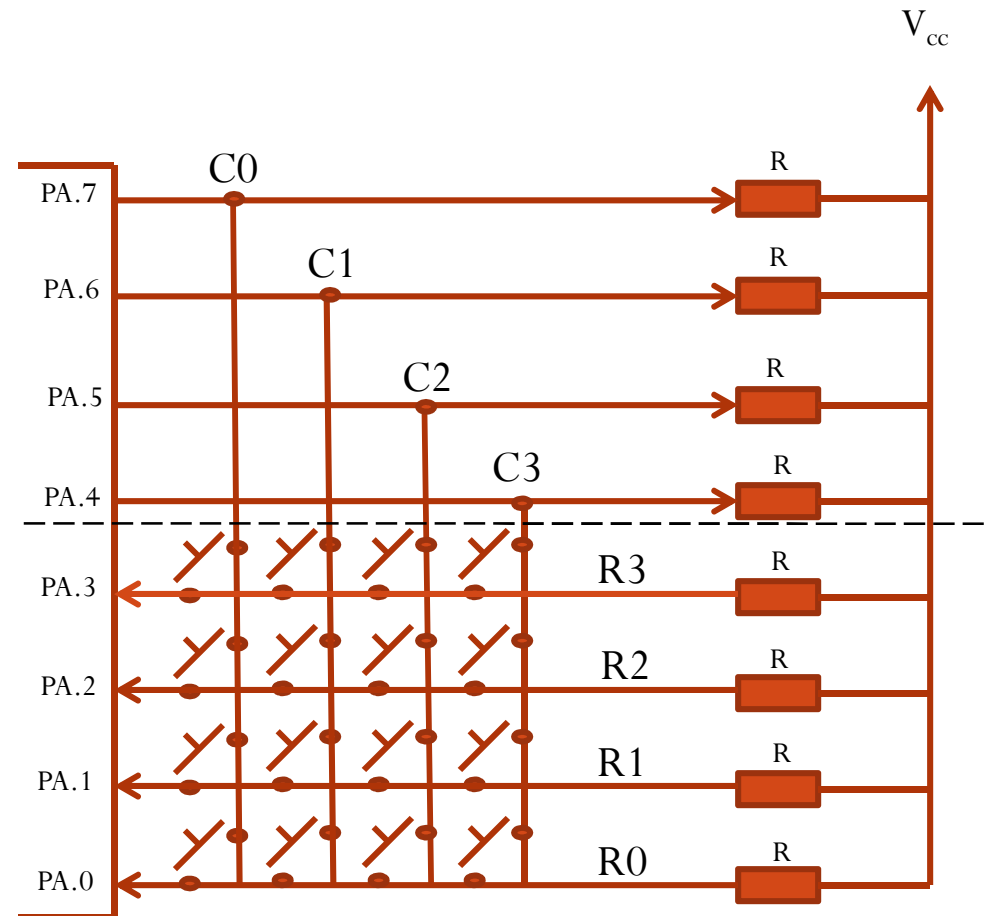
Row Scanning Technique

- First of all, send '0' only in column no. 0 (C0, i.e. PA.7)
- Now if the row lines [PA.3 to PA.0] are read, and if any '0' is read (say) from row 'r' [r=0 to 3], it will identify that the switch [in between column no. '0' and the specific row 'r'] is pressed
- If all rows are read as '1', it will correspond to 'no' key pressed in that column no. '0'.
- Then send '0' to other columns one after another [column no. c=0 to 3] and similarly the row lines is read, if this process is continuously repeated and if any key is pressed, it will be detected in this process of scanning.

Program on Row Scanning Technique (Part-I)

```
while (1)
    {
    // Place your code here
            PORTA=0b01111111;
            lcd_gotoxy(0,0);
            if (PINA.0==0)
                lcd_putsf("1");
            if (PINA.1==0)
                lcd_putsf("4");
            if (PINA.2==0)
                lcd_putsf("7");
            if (PINA.3==0)
                lcd_putsf("E");
```

Program on Row Scanning Technique (Part-II)

```
PORTA=0b10111111;
lcd_gotoxy(0,0);
if (PINA.0==0)
    lcd_putsf("2");
if (PINA.1==0)
    lcd_putsf("5");
if (PINA.2==0)
    lcd_putsf("8");
if (PINA.3==0)
    lcd_putsf("0");
```

Program on Row Scanning Technique (Part-III)

```
PORTA=0b11011111;
lcd_gotoxy(0,0);
if (PINA.0==0)
   lcd_putsf("3");
if (PINA.1==0)
   lcd_putsf("6");
if (PINA.2==0)
   lcd_putsf("9");
if (PINA.3==0)
   lcd_putsf("F");
```

Program on Row Scanning Technique (Part-IV)

```
PORTA=0b11101111;
lcd_gotoxy(0,0);
if (PINA.0==0)
    lcd_putsf("A");
if (PINA.1==0)
    lcd_putsf("B");
if (PINA.2==0)
    lcd_putsf("C");
if (PINA.3==0)
    lcd_putsf("D");
}
```

Thanks