

EC381: Embedded Systems Lab

Experiment No. 1

Title: Echoing the switch status to the LEDs in EdSim51

Date: 18th January 2022

Theory:

The Intel 8051 is a microcontroller that contains a CPU as well as some ports and peripherals which can be used to connect various devices to it, such as a seven segment display, ADC, DAC etc. Four such ports are available - **P0, P1, P2, and P3**, and each of these ports has 8 pins

In this experiment, the 8 pins of port **P2** are connected to 8 switches **SW0, SW1, SW2, ... , SW7**. These switches have been connected such that they are **active low**, ie, the voltage at the corresponding port pin will be non zero when the switch is open, and zero when the switch is closed.

To the 8 pins of port **P1**, 8 LEDs have been connected (**LED 0, LED 1, ... , LED 7**). These LEDs have been connected in such a way that they glow when the voltage at the corresponding port pin is high, and remain off otherwise.

In order to echo the switch status to the LEDs, port P2 is connected to port P1 internally via code, explained below.

Algorithm:

A single line of code is used to move the data on P2 pins to P1.

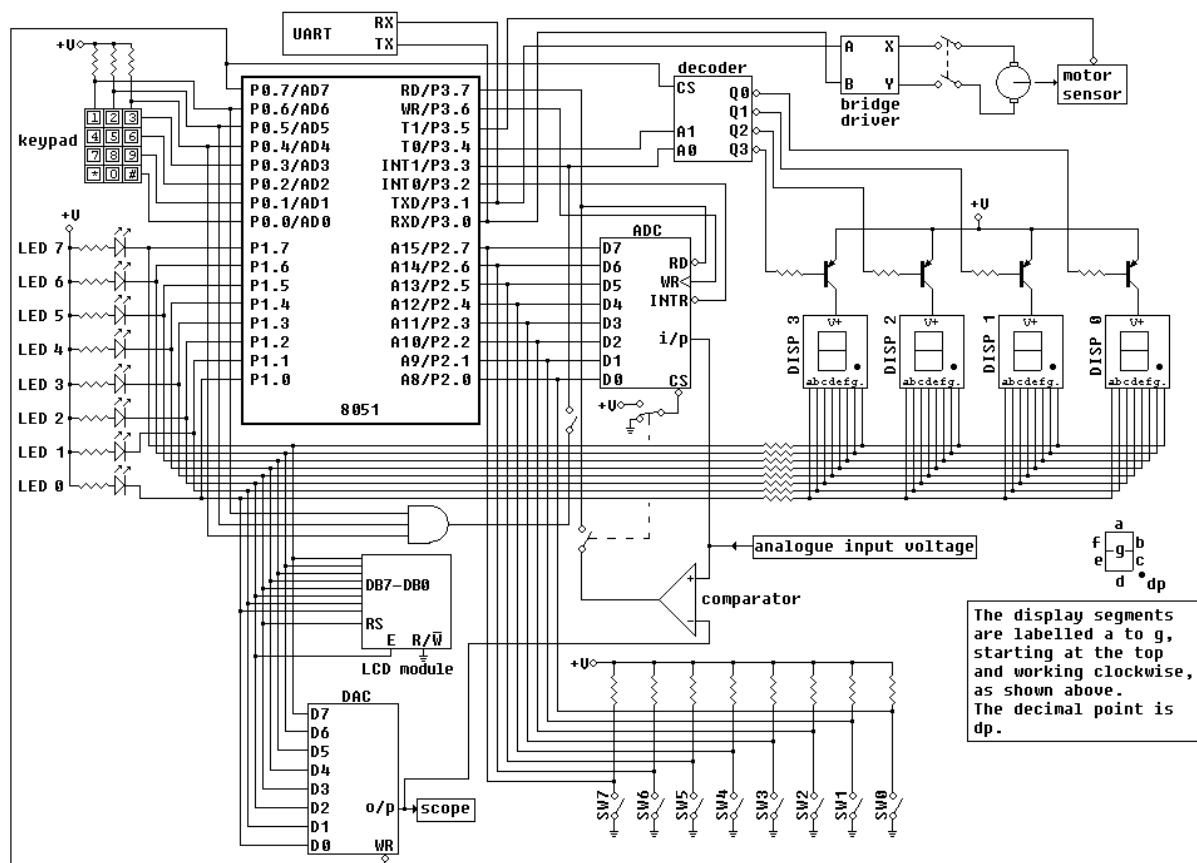
Code:

```
; This program very simply echoes the
; switches on P2 to the LEDs on P1.

; When a switch is closed a logic 0 appears
; on that P2 pin, which is then copied to
; that P1 bit which turns on that LED.
; Therefore, a closed switch is seen as a lit
; LED and vice versa.

start:
    MOV P1, P2    ; move data on P2 pins to P1
    JMP start     ; and repeat
```

Circuit Diagram:



Output, Observations, and Conclusions:

EdSim51DI - Version 2.1.31 & Dynamic Interface x | exp1.asm

System Clock (MHz): 12.0 | Update Freq: 1

Time: 3s 851ms 32us - Instructions: 19255

8051

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Remove All Breakpo...

Display-select Decoder CS|DAC WR
 P0.6 1 Keypad Column 2
 P0.5 1 Keypad Column 1
 P0.4 1 Keypad Column 0
 P0.3 1 Keypad Row 3
 P0.2 1 Keypad Row 2
 P0.1 1 Keypad Row 1
 P0.0 1 Keypad Row 0
 P1.7 1 LED 7|Seg. dp|DAC DB7|LED DB7
 P1.6 1 LED 6|Seg. g|DAC DB6|LED DB6
 P1.5 1 LED 5|Seg. f|DAC DB5|LED DB5
 P1.4 1 LED 4|Seg. e|DAC DB4|LED DB4
 P1.3 1 LED 3|... d|...DB3|...DB3|... RS
 P1.2 0 LED 2|... c|...DB2|...DB2|LCD E
 P1.1 0 LED 1|Seg. b|DAC DB1|LED DB1
 P1.0 1 LED 0|Seg. a|DAC DB0|LED DB0
 P2.7 1 SW 7|ADC DB7
 P2.6 1 SW 6|ADC DB6
 P2.5 1 SW 5|ADC DB5
 P2.4 1 SW 4|ADC DB4
 P2.3 1 SW 3|ADC DB3
 P2.2 0 SW 2|ADC DB2
 P2.1 0 SW 1|ADC DB1
 P2.0 1 SW 0|ADC DB0
 P3.7 1 ADC RD|Comparator Output
 P3.6 1 ADC WR
 P3.5 1 Motor Sensor
 P3.4 1 Display-select Input 1
 P3.3 1 AND Gate Output|Display-se...t 0
 P3.2 1 ADC INTR
 P3.1 1 Motor Control Bit 1|Ext. UART Rx
 P3.0 1 Motor Control Bit 0|Ext. UART Tx

start:
 0000| MOV P1, P2 ; move data on P2
 0003| JMP start ; and repeat

AND Gate Disabl...
 Key Bounce Disabl...
 Standard

0.0 V output
 Scope

U No Parity 8-bit UART @ 4800 Baud
 Rx Rx Reset
 Tx Tx Send

0.0 V input
 11111111
 MAX
 MIN
 Motor Enabled

22:07

The voltage at pins 1 and 2 of port P2 is low. This means that switches SW1 and SW2 are closed (since they are active low).

Corresponding to that, it is observed that LED1 and LED2 are glowing, ie the switch status is being successfully echoed to the LEDs.

Experiment performed by:

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