EXPERIMENT REPORT OF ASSEMBLY LANGUAGE

Assignment 2 Experiment 2

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Problem Description:

Chapter 3 Experiment 2 Simple IO and Lantern Control

(1) Do output with 8255 IO controller.
Now let us move to real hardware devices, although it is still an emulated one.

In this experiment, 8 LED lights are connected to the data bus the 8086 processor through port A of a piece of 8255, and a piece of 74LS138 is used to do address decoding. As is shown in figure3.2. The Y0 output of 74LS138 is assigned to 8255. And Address BUS A3 to A5, together A6 and A7 are used to be input of address decoder.

You are required to write a program to light the led one by one. You may start with D9, then light D8 and turn off D9, then move to the next D7, etc. When you reaches D1, please roll back to D2, and so on, till you turn on D9 again. And please do it repeatedly.

You may use logic shift instructions like SHL and SHR to generate the pattern code, and output pattern code through 8255.PortA to light the LEDs. And make use of a flag variable in your program to indicate on which direction should you shift the light.

Goal:

We are going to make a virtual device provided by the emu8086.Try to work with peripheral device.The virtual device can display can show up to 5 digits.

We use a word type to port 199 this is the IO address .

Each time we write a number to the port then a sub program is called “delay”,we need to wait for the display to be stable.

Code:

```
;==========================================================
;Description: Program of Assignment 2 Experiment 2
;Author:[ABID ALI][2019380141]
;Date:[05/22/2021]
;=================================================================='
;This is the program for experiment2 assignment 1
;In this program, we try to display,8 LED lights are connected to the data bus
;start with D9, then  light D8 and turn off D9, then move to the next D7, etc.
;When you reaches D1, please roll back  to D2, and so on, till you turn on D9 again.
;=====================================================================
.MODEL SMALL
.STACK 32
.DATA
   PORT_A EQU 40H              ;
   PORT_CTRL EQU 46H
   CTRLWORD_8255 =10000000B
   PATTERN_CODE DB  01H
   FLAG_SHIFT DB 00H
```

```
.CODE                        ;THIS IS THE PROGRAM ENTRY POINT
MAIN PROC FAR                ;LOAD THE DATA SEGMENT ADDRESS
   MOV AX, @DATA             ;ASSIGN VALUE TO DATA SEGMENT REGISTER
   MOV DS, AX
   ;TODO:PROGRAM 8255
   MOV DX, PORT_CTRL         ;MOVING THE VALUE OF PORT_CTRL IN 8 BIT DX REGISTER
   MOV AL, CTRLWORD_8255     ;MOVING THE VALUE OF CTRLWORD_8255 IN 8 BIT AL REGISTER
   OUT DX, AL

   ;Sometesting:output portA
   MOV DX, PORT_A            ;MOVING THE VALUE OF PORT_A IN 8 BIT DX REGISTER
   MOV AL, 0F5H              ;MOVING THE VALUE (0F5H) IN 8 BIT AL REGISTER
   OUT DX, AL

   MOV AL, PATTERN_CODE
   MOV DX, PORT_A
MOVE_LEFT:                   ;LABEL OF MOVE_LEFT
    OUT DX,AL
    CALL DELAY               ;CALL DELAY SUB PROCEDURE
    SHL AL, 1
    CMP AL,10000000B         ;COMPARING THE AL REGISTER WITHE THE VALUE
    JZ MOVE_RIGHT
    JMP MOVE_LEFT
MOVE_RIGHT:                  ;LABEL OF MOVE_RIGHT
    OUT DX, AL
    CALL DELAY               ;CALL DELAY SUB PROCEDURE
    SHR AL, 1
    CMP AL, 00000001H
    JZ MOVE_LEFT
    JMP MOVE_RIGHT
    MOV AX,4C00H              ;SET UP TO
    INT 21H                   ;RETURN TO DOS
MAIN ENDP
;;================================================================
;SUBROUTINE:DELAY
;DELAY FOR SOME MILLISECONDS
DELAY PROC NEAR
     PUSH BX;
     PUSH CX;
     MOV BX, 0FH
LOOP_OUT:
        MOV CX, 0FFH          ;LABEL OF OUTERLOOP
LOOP_INNER:                   ;LABEL OF INNERLOOP
        LOOP LOOP_INNER
        DEC BX
        JNZ LOOP_OUT
        POP CX                ;POP CX FROM THE STACK
        POP BX;               ;POP BX FROM THE STACK
        RET
DELAY    ENDP                 ;ENDING POINT DELAY SEGMENT
              END MAIN        ;THIS IS THE PROGRAM EXIT POINT
```

Explanation:

There are lot of model available for this program but we take the .MODEL SMALL

We choose Stack size of 32.

DATA SEGMENT

```
PORT_A EQU 40H                 ; PORT_A IS NOT A VARIABLE, IT IS JUST SYNONYM FOR NUMBER 40H
   PORT_CTRL EQU 46H           ; PORT_CTRL IS NOT A VARIABLE, IT IS JUST SYNONYM FOR NUMBER 46H
   CTRLWORD_8255 =10000000B    ;IN CTRLWORD_8255 THE VALUE ASSIGNED 10000000B
   PATTERN_CODE DB  01H                    ;PATTERN_CODE DATA BYTE IS 01H
   FLAG_SHIFT DB 00H                       ;FLAG_SHIFT CODE DATA BYTE IS 00H
```

CODE SEGMENT

```
MAIN PROC FAR                              ;LOAD THE DATA SEGMENT ADDRESS
    MOV AX, @DATA                          ;ASSIGN VALUE TO DATA SEGMENT REGISTER
    MOV DS, AX
    ;TODO1:PROGRAM 8255
    MOV DX, PORT_CTRL                      ;MOVING THE VALUE OF PORT_CTRL IN 8 BIT DX REGISTER
    MOV AL, CTRLWORD_8255                  ;MOVING THE VALUE OF CTRLWORD_8255 IN 8 BIT AL REGISTER
    OUT DX, AL
    ;TODO2:
    ;Sometesting:output portA
    MOV DX, PORT_A                         ;MOVING THE VALUE OF PORT_A IN 8 BIT DX REGISTER
    MOV AL, 0F5H                           ;MOVING THE VALUE (0F5H) IN 8 BIT AL REGISTER
    OUT DX, AL

    MOV AL, PATTERN_CODE
    MOV DX, PORT_A
MOVE_LEFT:                                 ;LABEL OF MOVE_LEFT
    OUT DX,AL
    CALL DELAY                             ;CALL DELAY SUB PROCEDURE
    SHL AL, 1                              ;MOVES ALL OF BITS IN AL  LEFT ONE PLACE
    CMP AL,10000000B                       ; COMPARING THE AL REGISTER WITH THE VALUE
    JZ MOVE_RIGHT                          ; JUMP ZERO INSTRUCTION,IT'S A CONDITIONAL INSTRUCTION
                                           ;IT JUMP WHEN ZERO FLAG(ZF) IS SET 1
                                           ;JZ is commonly used to explicitly test for something being equal to zero
    JMP MOVE_LEFT
MOVE_RIGHT:                                ;LABEL OF MOVE_RIGHT
    OUT DX, AL
    CALL DELAY                             ;CALL DELAY SUB PROCEDURE
    SHR AL, 1                              ;MOVES ALL OF BITS IN AL  RIGHT ONE PLACE
    CMP AL, 00000001H
    JZ MOVE_LEFT
    JMP MOVE_RIGHT
    MOV AX,4C00H                           ;SET UP TO
    INT 21H                                ;RETURN TO DOS
```

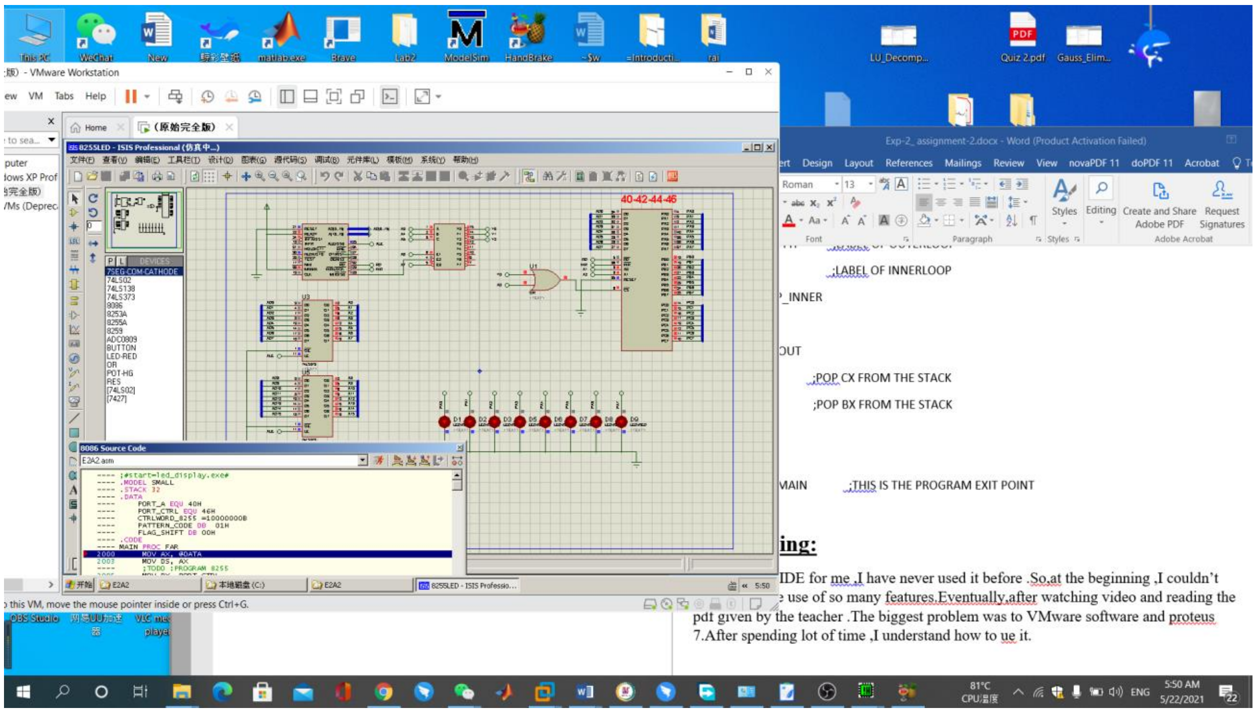
```
MAIN ENDP
```

SUBPROGRAM

```
;SUBROUTINE:DELAY
;DELAY FOR SOME MILLISECONDS
DELAY PROC NEAR
    PUSH BX;
    PUSH CX;
    MOV BX, 0FH
LOOP_OUT:
      MOV CX, 0FFH                       ;LABEL OF OUTERLOOP
LOOP_INNER:                              ;LABEL OF INNERLOOP
      LOOP LOOP_INNER                    ;LOOP INSTRUCTION IS USED FOR LOOPING
      DEC BX                             ;BX IS DECREMENTED
      JNZ LOOP_OUT                       ;JNZ IS JUMP NOT ZERO,IT'S A CONDITIONAL JUMP
                                         ;IT JUMPS TO LOOP_OT IF ZERO FLAG(ZF) IS 'ZERO'
      POP CX                             ;POP CX FROM THE STACK
      POP BX;                            ;POP BX FROM THE STACK
      RET                                ;IT'S THE RETURN INSTRUCTION
DELAY    ENDP                            ;;ENDING POINT DELAY SEGMENT
               END MAIN                  ;THIS IS THE PROGRAM EXIT POINT
```

Debugging:

This is a new IDE for me ,I have never used it before .So,at the beginning ,I couldn’t understand the use of so many features.Eventually,after watching video and reading the pdf given by the teacher .The biggest problem was to VMware software and proteus 7.After spending lot of time ,I understand how to use it.


8086 Source Code
E2A2.asm
Exp-2_ assignment-2.docx - Word (Product Activation Failed)
8255LED - ISIS Professional
40-42-44-46

```
---- ;#start=led_display.exe#
---- .MODEL SMALL
---- .STACK 32
---- .DATA
----     PORT_A EQU 40H
----     PORT_CTRL EQU 46H
----     CTRLWORD_8255 =10000000B
----     PATTERN_CODE DB  01H
----     FLAG_SHIFT DB 00H
---- .CODE
---- MAIN PROC FAR
2000      MOV AX, @DATA
2003      MOV DS, AX
----      ;TODO :PROGRAM 8255
```

```
;LABEL OF INNERLOOP
P_INNER
OUT
;POP CX FROM THE STACK
;POP BX FROM THE STACK
MAIN        ;THIS IS THE PROGRAM EXIT POINT
```

ing:

IDE for me ,I have never used it before .So,at the beginning ,I couldn't
e use of so many features.Eventually,after watching video and reading the
pdf given by the teacher .The biggest problem was to VMware software and proteus
7.After spending lot of time ,I understand how to ue it.

Attachment:

1) Experiment-2(assignment-2).m4v
2) Exp-2_ assignment 2.asm
3) Exp-2_ assignment 2.pdf

Acknowledgement:

I complete this assignment by myself by using online videos and taking help from online.The most useful help from teacher's hint given in question ,the theory class and the lecture note from the practical class.