Visvesvaraya National Institute of Technology, Nagpur

Department of Electronics and Communication Engineering

ADVANCED MICROPROCESSOR AND INTERFACING PROJECT REPORT

Submitted to: Dr. Vaijayanti Panse

Course: Advanced Microprocessor and Interfacing (ECL410)

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Project Title: Traffic Light Controller

Submitted By:

S. No.	Name of Students	Roll No.
1	Bhumik Patil	BT21ECE034
2	Ashay Atkar	BT21ECE060
3	Yatharth Suneel	BT21ECE066
4	Anurag Sahu	BT21ECE093

Project Summary:

Traffic management is a critical aspect of modern urban planning, ensuring safety and efficient flow of vehicles and pedestrians. This project presents a Traffic Light Controller implemented using the 8086 Microprocessor, along with supporting hardware components like the 74HC737 Latch, 8255 Programmable Peripheral Interface (PPI) modules, 7-segment displays, and LED indicators for the red, green, and yellow lights.

The primary goal of the system is to simulate a functional traffic light controller, mimicking real-world operations at a four-way intersection. The system is designed to manage traffic flow by controlling the lights' timing sequence, providing a practical demonstration of microprocessor-based automation and hardware interfacing.

The traffic light controller project demonstrates the effective use of the 8086 microprocessor and peripheral hardware components to simulate a functional traffic management system. By integrating components like the 74HC737 latch, 8255 PPI, 7-segment displays, and LED indicators, the system successfully replicates the real-world operation of a traffic signal, ensuring seamless light transitions and countdown timers. This project highlights the potential of microprocessor-based systems in developing cost-effective and reliable solutions for traffic management.

i. **Components Requirements:**

   a. **8086 Microprocessor:** Acts as the central control unit, executing the program logic to determine light sequences and timing.

   b. **74HC737 Latch:** Facilitates stable data transfer between the microprocessor and peripherals, ensuring proper signal synchronization.

   c. **8255 PPI Modules:** Used to interface with LEDs, 7-segment displays, and other input/output devices, enabling efficient control of the traffic light system.

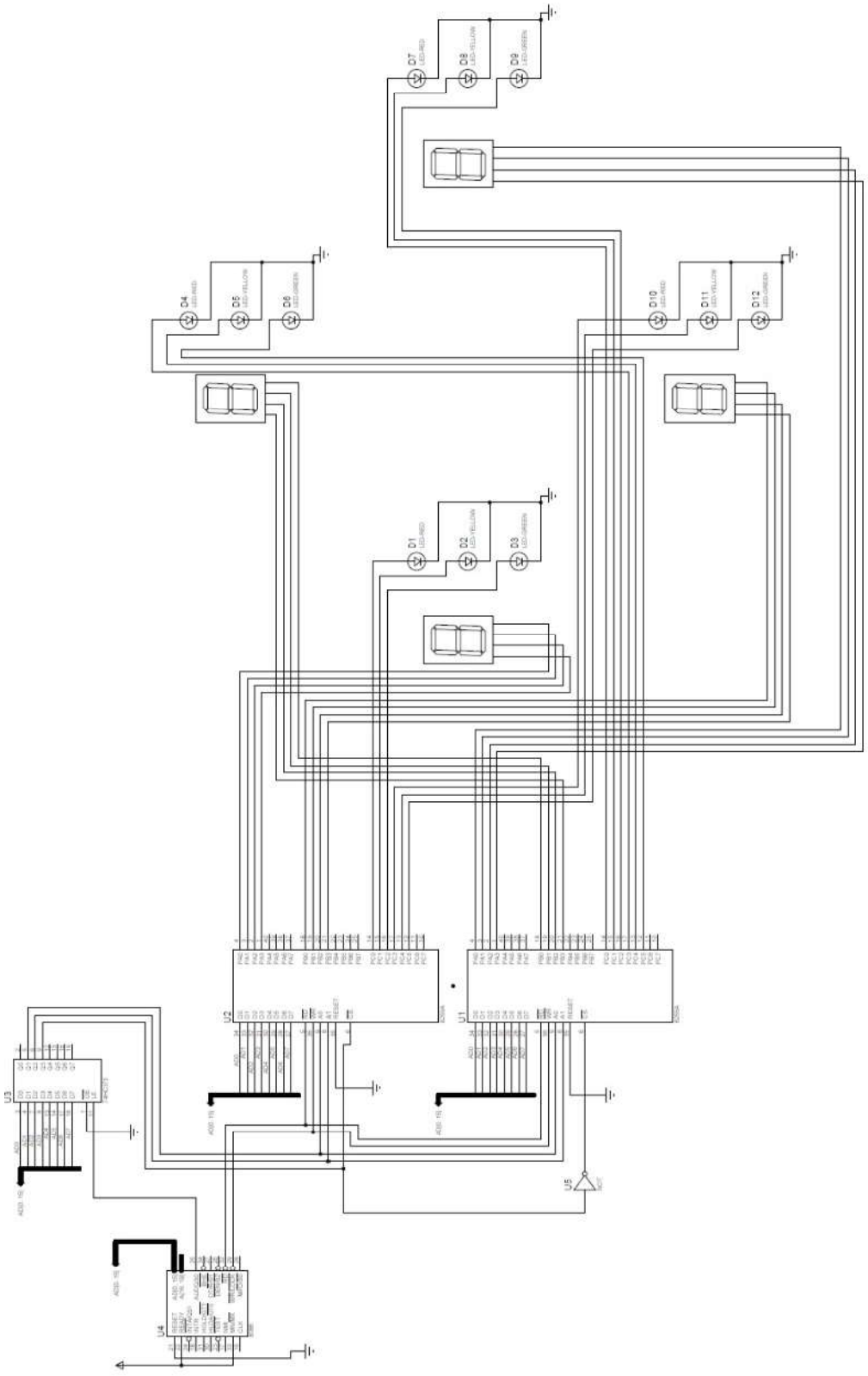
   d. **7-Segment Displays:** Show the countdown timers for the red, green, and yellow phases, enhancing user awareness.

   e. **LEDs:** Represent the traffic lights, visually simulating red, green, and yellow signals.

ii. This project demonstrates the integration of hardware and software in creating an embedded system. The program logic is written in assembly language for the 8086 microprocessor, emphasizing the importance of timing, parallel I/O operations, and real-time responsiveness. The result is a cost-effective and scalable solution that can serve as a prototype for traffic signal management in real-world applications.

iii. **Software Requirements:-** Proteus 8 Professional

iv. Block diagrams :-



v. CODE:

```
CODE SEGMENT
START:
 MOV AL, 80H
 OUT 000EH, AL
 OUT 0006H, AL
AGAIN:
 ;FIRST INITIALIZED CONDITION
 MOV BH, 03H ; INITIALIZING COUNTS
 MOV BL, 03H
 MOV DH, 06H
 MOV DL, 09H
 MOV AL, 0CH
 OUT 0004H, AL ; SETTING UP LIGHTS
 MOV AL, 09H
 OUT 000CH, AL ; WE CAN ALSO USE BSR MODE
 ;MOV AL, 05H
 ;OUT 0006H, AL
 ;MOV AL, 07H
 ;OUT 0006H, AL
 ;MOV AL, 01H
 ;OUT 000EH, AL
 ;MOV AL, 07H
 ;OUT 000EH, AL
 MOV AH, 02H ; COUNTER FOR FIRST TWO COUNTS
LOOP2:
 CALL DISPLAY
 DEC BH
 DEC BL
 DEC DH
 DEC DL
 CALL DELAY
 DEC AH
 JNZ LOOP2
 CALL DISPLAY
 MOV AL, 0AH ; SETTING UP YELLOW LIGHT
 OUT 0004H, AL
 DEC BH
 DEC BL
 DEC DH
 DEC DL
 CALL DELAY
 CALL DISPLAY
```

```
 ;SECOND INITIALIZED CONDITION
 MOV BH, 09H
 MOV BL, 03H
 MOV DH, 03H
 MOV DL, 06H
 MOV AL, 21H
 OUT 0004H, AL; SETTING UP LIGHTS
 MOV AL, 09H
 OUT 000CH, AL
 MOV AH, 02H
LOOP3:
 CALL DISPLAY
 DEC BH
 DEC BL
 DEC DH
 DEC DL
 CALL DELAY
 DEC AH
 JNZ LOOP3
 CALL DISPLAY
 MOV AL, 11H
 OUT 0004H, AL
 DEC BH
 DEC BL
 DEC DH
 DEC DL
 CALL DELAY
 CALL DISPLAY


 ;THIRD INITIALIZED CONDITION
 MOV BH, 06H
 MOV BL, 09H
 MOV DH, 03H
 MOV DL, 03H
 MOV AL, 09H
 OUT 0004H, AL; SETTING UP LIGHTS
 MOV AL, 0CH
 OUT 000CH, AL
 MOV AH, 02H
LOOP4:
 CALL DISPLAY
 DEC BH
 DEC BL
```

```
 DEC DH
 DEC DL
 CALL DELAY
 DEC AH
 JNZ LOOP4
 CALL DISPLAY
 MOV AL, 0AH
 OUT 000CH, AL
 DEC BH
 DEC BL
 DEC DH
 DEC DL
 CALL DELAY
 CALL DISPLAY


 ;FOURTH INITIALIZED CONDITION
 MOV BH, 03H
 MOV BL, 06H
 MOV DH, 09H
 MOV DL, 03H
 MOV AL, 09H
 OUT 0004H, AL; SETTING UP LIGHTS
 MOV AL, 21H
 OUT 000CH, AL
 MOV AH, 02H
LOOP5:
 CALL DISPLAY
 DEC BH
 DEC BL
 DEC DH
 DEC DL
 CALL DELAY
 DEC AH
 JNZ LOOP5
 CALL DISPLAY
 MOV AL, 11H
 OUT 000CH, AL
 DEC BH
 DEC BL
 DEC DH
 DEC DL
 CALL DELAY
 CALL DISPLAY
```

```
JMP AGAIN ; GO TO FIRST INITIALIZED CONDITION
; SUBROUTINES
DISPLAY PROC NEAR
    MOV AL, BH
    OUT 0000H, AL
    MOV AL, BL
    OUT 0002H, AL
    MOV AL, DH
    OUT 0008H, AL
    MOV AL, DL
    OUT 000AH, AL
    RET
DISPLAY ENDP


DELAY PROC NEAR
    MOV CX, 0FFFFH
    LOOP1:NOP
    LOOP LOOP1
    RET
DELAY ENDP
```

vi. Conclusion:

A minimalistic and fully functional traffic light controller which is working on specific timing is implemented which could be extended to real world situation.

vii. Future Work:

a. Sensor Integration: Incorporate sensors to detect vehicle presence, enabling dynamic traffic light control based on real-time conditions.
b. Pedestrian Assistance: Add pedestrian crossing controls with dedicated buttons and countdown displays.
c. Connectivity: Enable communication between multiple controllers to manage complex intersections.
d. Solar Power: Explore renewable energy sources like solar panels to make the system eco-friendly.
e. Opposite Lights could operate simultaneously which could reduce the waiting time.