



# Finite State Machine

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## I. ABSTRACT

This paper explains a Finite State Machine by deconstructing the decade counter and here we verified the both incrementing decoder from 0 to 9 and decrementing decoder from 9 to 0 using arduino uno.

## II. COMPONENTS

The required components list is given in Table: I., seven segment display is shown in Fig.1, and 7474 D-Flip Flop pin diagram is shown in Fig-2.

| Components            | Value | Quantity |
|-----------------------|-------|----------|
| IC                    | 7474  | 2        |
| seven segment display |       | 1        |
| Arduino               | UNO   | 1        |
| Jumper Wires          |       | 50       |
| Breadboard            |       | 1        |

TABLE I

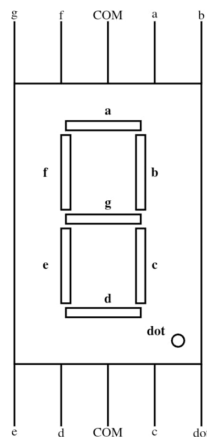


Fig. 1.

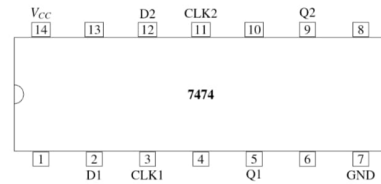


Fig. 2.

## III. PROCEDURE

- 1) Make the connections of arduino, and two 7474 ICs according to Fig-3.

|         | INPUT |    |    |    |    | OUTPUT |    |    |  |  | CLOCK |      | 5V |   |    |    |
|---------|-------|----|----|----|----|--------|----|----|--|--|-------|------|----|---|----|----|
|         | W     | X  | Y  | Z  | A  | B      | C  | D  |  |  | D13   |      |    |   |    |    |
| Arduino | D6    | D7 | D8 | D9 | D2 | D3     | D4 | D5 |  |  | CLK1  | CLK2 | 1  | 4 | 10 | 13 |
| 7474    | 5     | 9  |    |    | 2  | 12     |    |    |  |  | CLK1  | CLK2 | 1  | 4 | 10 | 13 |
| 7447    |       |    |    |    | 7  | 1      | 2  | 6  |  |  |       |      |    |   |    | 16 |

Fig. 3.

- 2) Block diagram of fsm for decade counter

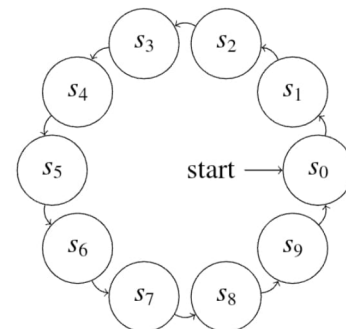


Fig. 4.

### 3) Block diagram of Decade Counter.

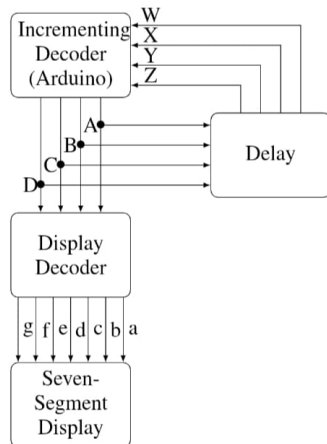


Fig. 5.

### 4) Block diagram of Decade Counter FSM implementation using D-Flip Flops.

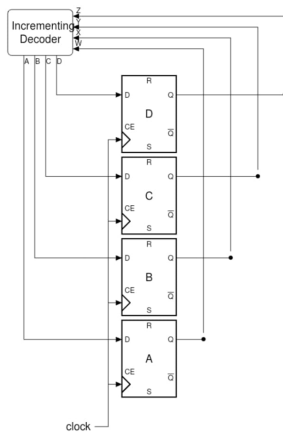


Fig. 6.

### 5) Truth Table for incrementing from 0 to 9 in seven segment display

| Z | Y | X | W | D | C | B | A |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

TABLE II

### 6) Truth Table for decrementing from 9 to 0 in seven segment display

| Z | Y | X | W | D | C | B | A |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |

TABLE III

- 7) Execute the arduino code without any errors.
- 8) After upload the code into hardware setup using arduino IDE platfo rm with hex file.

## IV. RESULTS

- 1) Download the code given in the link below and execute the m to see the output as shown in Fig.6 shows incremented output and fig.7 shows decremented output.
- 2) <https://github.com/rajib05ra/FWC-Assignments/tree/main/Assignment>

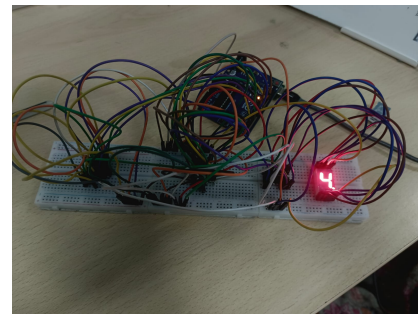


Fig. 7.

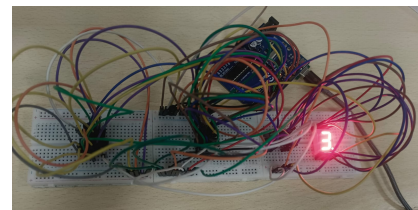


Fig. 8.

## V. CONCLUSION

Hence implementation of 7474 IC Decade Couner on Seven segment dispaly using arduino UNO is done.