EDW Assignment - 1: 7-Segment Display Logic Mapper

MAHIB - 2023UEC2569

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Objective

The objective of this assignment was to design a schematic involving a 4-input DIP switch, a custom logic mapper, and a 7-segment display. The project required creating Boolean expressions for the custom logic mapper and connecting the outputs to the respective inputs of a 7-segment display.

Schematic Overview

The schematic consists of four input signals labeled A, B, C, and D. These inputs are connected to a 4-input DIP switch, which allows the user to toggle between different logic states. The outputs from the DIP switch are then fed into a custom logic mapper, which calculates the values for seven output signals: a, b, c, d, e, f, and g. These outputs are connected to the respective inputs of the 7-segment display.

Logic Mapper

The logic mapper consists of the following Boolean equations for the seven outputs:

$$a = B'D' + BC + AD' + A'C + AB'C' + A'BD$$

$$b = B'D' + B'C' + A'CD + AC'D + A'C'D'$$

$$c = AB' + C'D + A'B + A'D + B'C'$$

$$d = BCD' + ABC' + B'C'D' + BC'D + A'B'C' + B'CD$$

$$e = B'D' + CD' + AB + AC$$

$$f = AB' + BD' + AC + C'D' + A'BC'$$

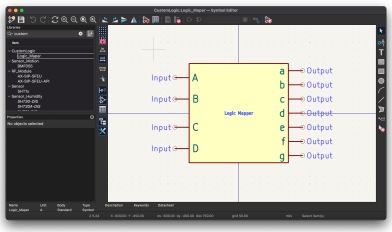
$$g = CD' + AB' + B'C + AD + A'BC'$$

7-Segment Display

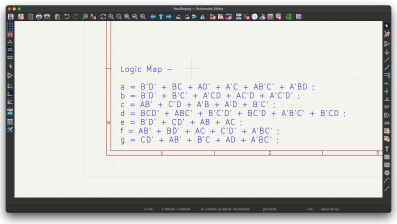
The outputs from the logic mapper are connected to the respective red inputs of a 7-segment display. The common anode input of the display is connected to V_{cc} (5V), with a 220-ohm resistor in series to maintain the required 2V potential difference across the LEDs in the display.

Schematic and Custom Symbols

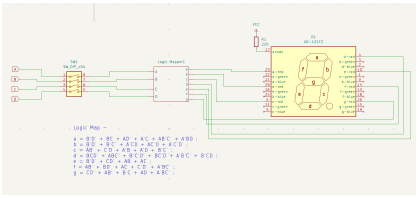
Below are the images for the schematic design and the custom symbols used in the project. Each image is displayed as a subfigure.



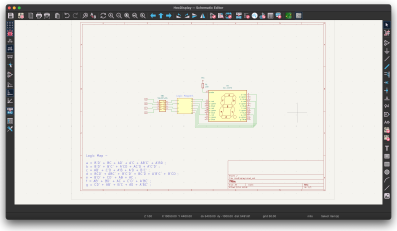
(a) Logic Mapper Custom Symbol



(b) Logic Mapper Equations



(c) Schematic



(d) Full Schematic

Figure 1: Schematic and Custom Symbols

Conclusion

This assignment allowed me to design a complex logic circuit with multiple inputs and outputs, and connect them to a 7-segment display to visualize the results. The custom logic mapper was designed using Boolean expressions and the 7-segment display was wired with the appropriate components to display the output in a readable format.