Diagram

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LAB TITLE

**Code Conversions and Parity**

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Abstract

In this lab, used Boolean algebra to simplify expressions and then plotted them onto KMaps. We also used the XOR gate chip and implemented it on the ELVIS Board.

Introduction

Initially, we will transfer grey code into binary code. Then we can create a truth table out of these vaiables accordingly. After that, we plotted these values onto a KMAP to verify our simplified expression. After that, we implemented the simplified expression onto Logisim and the ELVIS Board.

Theoretical Background

For this lab we are required to use the Kmaps to create the Boolean expression. This time only we need to to know the properties of an XOR kmap which was present in the exercises of this lab. As usual we use this Boolean expression to find out how many OR gates to use and how will we input the variables.

Experimental work, Results and Discussion

**Lab Exercises:**

**Exercise 1**

Design a combinational circuit with four inputs and four outputs that converts the four-bit Gray code into an equivalent four-bit binary number.

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

We just converted the grey code to the binary code in 4 bits. This gives us the truth table for our expression to be.

Use the Karnaugh map technique to simplify the expression.  Hint: You can rewrite the expression to use the minimum number of gates.

A close-up of a white sheet

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A green lines with arrows

Description automatically generatedA green line with arrows

Description automatically generatedA close-up of wires on a circuit board

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A screenshot of a computer

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A screenshot of a computer program

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We tested the ELVIS board and the simulation using the truth table in part A.

**Exercise 2:**

Design a circuit that generates an even parity bit from four message bits. Hint: You can rewrite the expression to use the minimum number of gates.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **D** | **Peven** | **Podd** |
| 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 |

**A computer screen shot of a diagram

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Implementing the simulation and proving it using the Podd and the Peven truth table.

A close-up of a circuit board

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**A screenshot of a computer program

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Again we tested the ELVIS board and the simulation using the truth table in part A.

Conclusion

We have revised the concept of KMap and got simplified expressions from them. We have also learned how to implement XOR onto the ELVIS Board. Then we verified our values with the truth table. We also designed a circuit for an ven number of parity bits and then the same for the odd number of parity bits.