Cyclic Redundancy Coding

Fifth Laboratory Report for CENG 3331

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Abstract

The goal of this lab was to understand how CRC hardware generates CRC check bits. During this lab, we built a CRC circuit and viewed the generated check bits, named different types of n-bit CRC, and converted a polynomial to a binary message. Finally, we did binary division over a given binary sequence and input that into our simulation.

Write-Up

Introduction

Cyclic redundancy check is a data transmission error technique that calculates a check code for data in a data frame based on a certain algorithm. It is based on binary division, which is a main part of this experiment. To visualize how this works, we used Multisim to construct our circuit.

Task 1:

We began our experiment by constructing the 5-bit cyclic redundancy check generator circuit using 18 components: 2 switches, 2 grounds, a Vcc power source, 3 exclusive or gates, 5 dual d flip-flops, and 5 probes. This circuit can be seen in the appendices section under Figure 1. We viewed the output of this circuit by opening and closing one of the switches. Following this, we answered some questions given to us in the lab instructions. For the first question, some different types of n-bit CRC in use today are: CRC-12, CRC-16, CRC-CCITT, and CRC-32. For the second question, the polynomial $X^{11}+X^{7}+X^{3}+X^{1}+1$ is equivalent to 100010001011 in binary. This is done by placing a 1 at the position given by the exponents going from right to left starting at position 0.

Task 2:

For task 2, we continued the experiment by doing binary division on the given binary sequence 1011001101 which we would divide by 1110. The binary division of this can be seen in the appendix under Figure 2. We continued by changing the fifth bit from the left of the dividend above, which produced the sequence 1011101101, and doing binary division with the same divisor. This can be seen under Figure 3 in the appendix.

Appendix

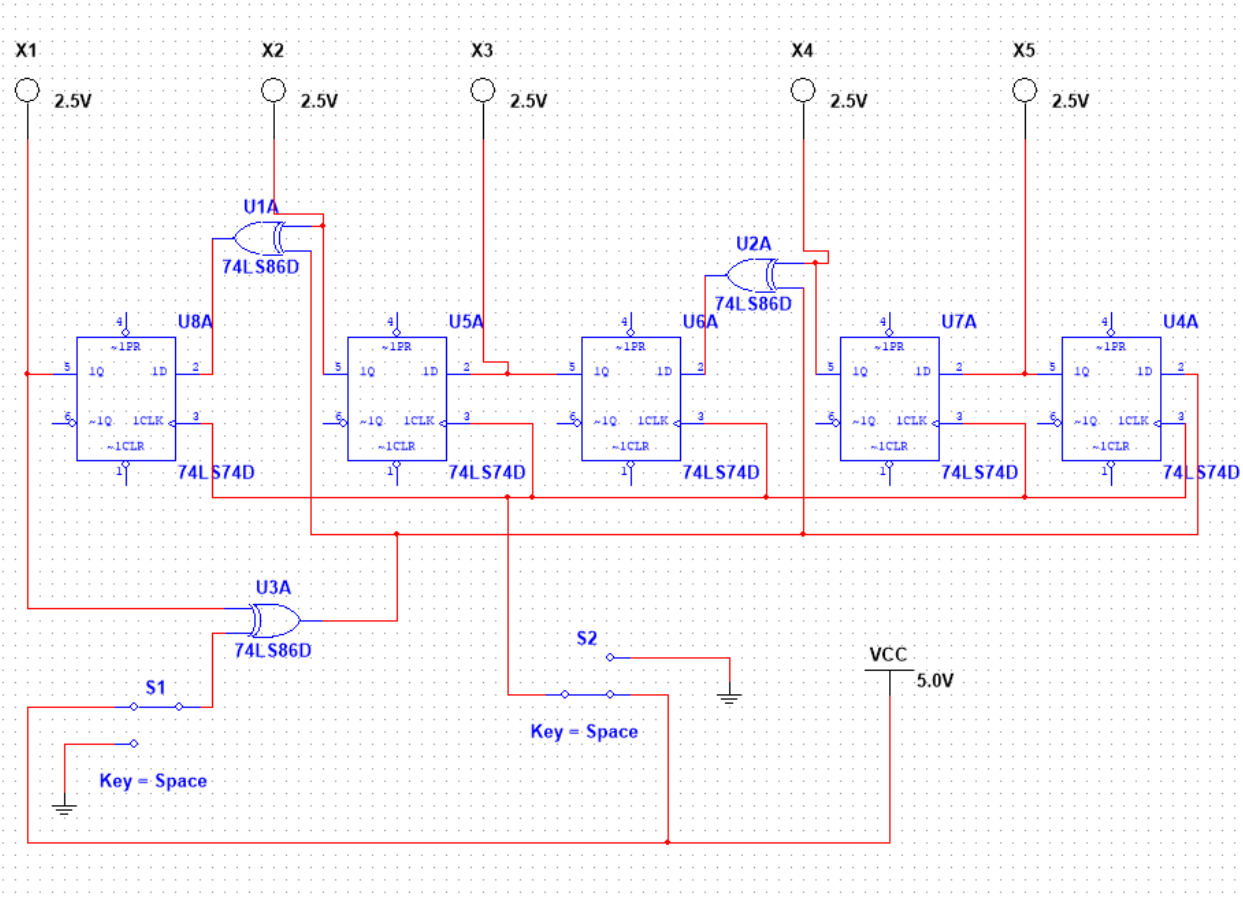

Fig. 1. Circuit Diagram Task 1

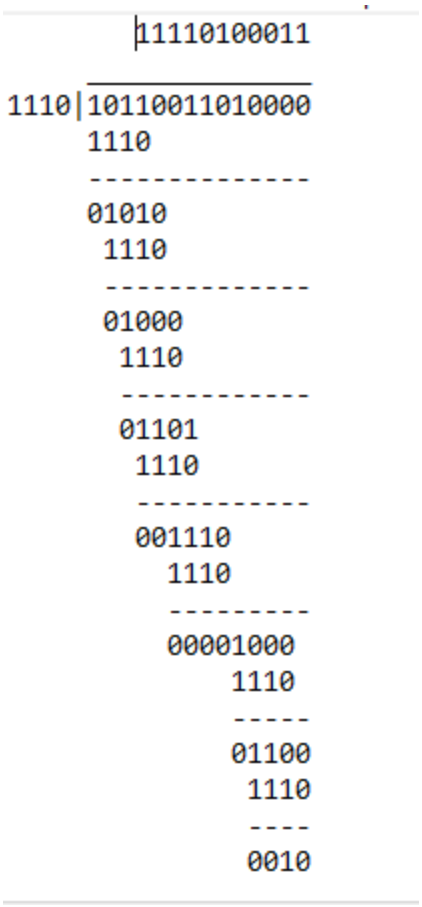

Fig. 2. Task 2 Part 1 Binary Division

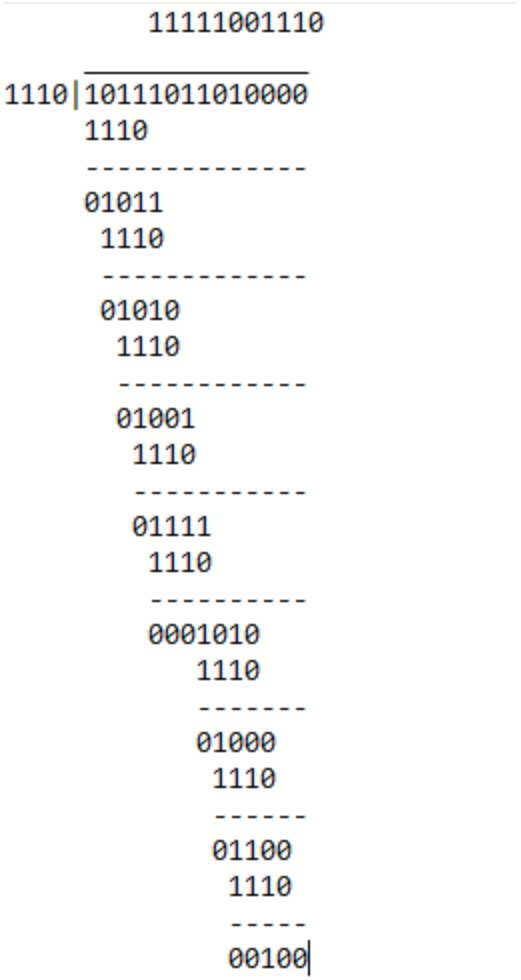

Fig. 3. Task 2 Part 2 Binary Division

Conclusion

In conclusion, this experiment showed us how a CRC circuit generates CRC check bits. It also allowed us to practice how to convert a polynomial to a binary message and also how to perform binary division to enter a message into the circuit we made.