

Controlling Seven Segment Displays Using Object-Oriented Programming Embedded Design: Enabling Robotics EECE2160

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Abstract

This laboratory experiment was intended to be a conclusion to the course, which integrates all concepts covered, including, but not limited to, bits and hexadecimal, digital logic, object-oriented C++ , and headers and makefiles. By integrating all of these concepts together, with minimal assistance, the course leaves us with proficient knowledge of them. As a result of the lab, three header files, `DE1SoCfpga.h`, `LEDControl.h`, and `SevenSegment.h`, and their respective `.cpp` files were created, in addition to a `main.cpp` file containing code to interact with headers, and a makefile to compile everything together.

KEYWORDS: bits, hexadecimal, digital logic, object-oriented, headers, makefiles, DE1SoCfpga, LEDControl, SevenSegment

1 Equipment

Available equipment included:

- DE1-SoC board
- DE1-SoC Power Cable
- USB-A to USB-B Cable
- Computer
- MobaXTerm SSH Terminal
- USB-to-ethernet Adapter
- gcc compiler

2 Introduction

3 Discussion & Analysis

3.1 Assignment 1

The purpose of assignment one was simply logic-based. It was necessary to consider the 7-bit logic behind seven-segment displays, and generate a table representing a hexadecimal number or letter in decimal, binary, and hexadecimal. The table is shown below.

#	6	5	4	3	2	1	0	Decimal	Hex
0	0	1	1	1	1	1	1	63	0x3F
1	0	0	0	0	1	1	0	6	0x6
2	1	0	1	1	0	1	1	91	0x5B
3	1	0	0	1	1	1	1	79	0x4F
4	1	1	0	0	1	1	0	102	0x66
5	1	1	0	1	1	0	1	109	0x6D
6	1	1	1	1	1	0	1	125	0x7D
7	0	0	0	0	1	1	1	7	0x7
8	1	1	1	1	1	1	1	127	0x7F
9	1	1	0	1	1	1	1	111	0x6F
A	1	1	1	0	1	1	1	119	0x77
b	1	1	1	1	1	0	0	124	0x7C
C	0	1	1	1	0	0	1	57	0x39
d	1	0	1	1	1	1	0	94	0x5E
e	1	1	1	1	0	0	1	121	0x79
f	1	1	1	0	0	0	1	113	0x71

3.2 Assignment 2

3.3 Assignment 3

3.4 Assignment 4

4 Conclusion

Overall, this laboratory project was an effective way to finish off the course. By having us draw from concepts learned throughout the entirety of the course, we were able to effectively work with a hardware device integrated with C++. As such, through the creation of new code, as well as integration of code from previous labs, DE1SoCfpga board interaction was converted to a fully object-oriented C++ program, encompassing all course concepts.