P5

Digital Objects

We are going to revisit the digits lab P2 but this time we treat the digital components as objects. This has the advantage that we can look at the state of the circuit because objects have persistent data. The extra work is programming project 14.9 in the Savitch book. It's quite long so you should read it as part of the preparation. OK. It's not quite DOOM3 but it should be fun.

Schedule		
Preparation time	:	3 hours
Lab time	:	3 hours

Items provided		
Tools	:	None
Components	:	None
Equipment	:	None
Software	:	None

Items to bring

Essentials. A full list is available on the Laboratory website at
https://secure.ecs.soton.ac.uk/notes/ellabs/databook/essentials/

Before you come to the lab, it is essential that you read through this document and complete *all* of the preparation work in section 2. If possible, prepare for the lab with your usual lab partner. Only preparation which is recorded in your laboratory logbook will contribute towards your mark for this exercise. There is no objection to several students working together on preparation, as long as all understand the results of that work. Before starting your preparation, read through all sections of these notes so that you are fully aware of what you will have to do in the lab.

> **Academic Integrity** – *If you undertake the preparation jointly with other students, it is important that you acknowledge this fact in your logbook. Similarly, you may want to use sources from the internet or books to help answer some of the questions. Again, record any sources in your logbook.*

Revision History

February 24 2013   Jeff Reeve(jsr)   First version of this lab created

1   Aims, Learning Outcomes and Outline

This laboratory exercise aims to:

- Develop digital circuits using objects in C++
- Use the rules of inheritance to proper effect.
- Use destructors where necessary.

Having successfully completed the lab, you will be able to:

- Learn to regard physical things as objects in C++
- Learn the value of inheritance and where it might apply
- Appreciate a modular approach to programming problems

To prepare this lab you will need to look again at the P2 lab because we are going to do it all again using objects. If you did use an object oriented approach then you may use the code in this lab although you will probably need to add the inheritance bits. Plan your program by first looking at the possibilities for using inheritance. Your program should start by defining the basic gates, then a half adder that uses these gates then a full adder and so on.

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2   Preparation

Read through the course handbook statement on safety and safe working practices, and your copy of the standard operating procedure. Make sure that you understand how to work safely. Read through this document so you are aware of what you will be expected to do in the lab.

2.1   Preparation Section 1

With reference to the P2 lab. Decide how you are going to define your gates as objects. To begin this process you have to think about the final program. In class we used constructors to do everything but this approach is unlikely to be useful to you in the long run. Read through Chapter 14 of Savitch/5e.

- Describe the overall structure of your program.

- Define your gate classes using inheritance including any destructors you might need.

- In general when should you use *delete* and *delete[]*

2.2   Preparation Section 2

Read through programming project 14.9 in the Savitch text.

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3   Laboratory Work

Code up your adder and subtracter. Test it so that you can show evidence that it works correctly.

4   Optional Additional Work

Marks will only be awarded for this section if you have already completed all of Section 3 to an excellent standard and with excellent understanding.

Do the programming project 14.9 from Savitch/5e.

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Appendices

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References

HTTLAP

C++ web reference