Project #5

Project <u>Demos</u> are scheduled for 5:30–6:45pm on Wednesday 3 May 2006 in the VLSI Design Lab

Project <u>Reports & Source Files</u> are due to Kevin Schaffer by 3:00pm on Thursday 4 May 2006

this project counts as 30% of your course grade

For the final class project, use the Altera MAX+PLUS II tools to implement a design of your choice on the Altera UP1 Education Board, subject to the requirements below:

- you must use either the MAX 7000 or FLEX 10K device on the UP1 Education Board
- your design must have at least 3 major components, two of which must be non-trivial components specified using VHDL, and one of which must be a state machine
- you must use at least one input device (e.g., push-button, DIP switch, mouse, or keyboard) and at least one output device (e.g., LED, 7-segment display, or video monitor). Prof. Walker or Kevin Schaffer can waive this requirement for complex designs that do not require I/O.

Possible projects might include, but are not limited to:

- a comparison of several addition circuits, multiplication circuits, or other arithmetic circuits
- interesting extensions to the MIPS processor from the Hamblen book
- an image processing system, a video game, or something interesting using the keyboard, mouse, and / or monitor
- other projects of similar complexity, sufficiently harder than previous projects that we will be convinced it is worth 30% of your grade (feel free to discuss your project ideas with me or Kevin Schaffer in advance)

In class on the date listed above, you must **describe and demonstrate your design** through a 10 minute presentation, which should include:

a) An overview of your design and any major design decisions that you made, including how you met the project requirements, along with a description of what's particularly interesting in your design, and what you had to learn about to make it work
b) Displays (on the computer) or printouts of the major components of the design
c) A "live" demo of your design in operation

The demonstration counts 10 points, and a working design counts 25 points.

By the date listed above, you must also turn in (to Kevin Schaffer) **a repor**t consisting of the items listed below along with a CDROM containing the <u>source</u> files for your project (or, if you prefer, email a ZIP archive of those files):

a) An overview of your design and any major design decisions that you made, including how you met the project requirements, along with a description of what's particularly interesting in your design, and what you had to learn about to make it work (25 points)
b) Printouts of the major components of the design (10 points)
c) Simulations showing the full operation of your project, plus any additional simulations of individual components that may be necessary to demonstrate more fully how each works (30 points)

Note that this documentation is worth 65% of your grade on this project, so be sure to allocate sufficient time for this part of the project, along with allocating time to get the design to work. A one-page document on design decisions and a couple of un-annotated simulations will not count for much!

If you are unable to get your design completely working to your satisfaction, describe what you tried to do, what does work, what does not work, and what you would do to make the rest of the design work if you had more time.

A simpler design that works and is well documented is worth more than an overly ambitious design that does not work and is poorly documented. Choose your design wisely, and consider the point values above in allocating your time!