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6.111 Final Project  
October 31, 2005

### **Abstract**

This final project will involve the creation of a small computer on the FPGA. Significant components of this design will include a fairly advanced CPU, an I/O module, and firmware. The CPU will be a considerable undertaking in itself, including a wide word size (64 bits), a sophisticated register file with multiple read and write ports allowing for additional useful instructions, a stack implementation in hardware, timing abilities, and several I/O ports. On the topic of I/O, that module will act as the interface between the CPU and the peripheral devices, which will include no less than a keyboard and a monitor (considering that the absence of either would produce a very awkward user interface) and potentially more, such as speakers, a microphone, or a mouse. Running on top of this will be a few layers of software (written, of course, in the CPU's language) including basic booting and initialization code from ROM, followed by an operating system (the complexity of which shall be determined by the power of the computer and the ability of the author). In order to bring the software task to a reasonable level of complexity, an assembler shall need to be written at least to convert code into memory initialization files, and hopefully also to assemble code on the computer itself (which would require the assembler to be written for the CPU first). Finally, to culminate this project, the ideal scenario would have a few small demo programs (probably games) written to run on the computer.