Independent Study: “Physics Coding With C” Peter Krieg

Fall 2014 Semester

**Overview**: For my independent study (IS), I had 2 main goals:

1. Become more proficient with the programming language C, and understand some core concepts of basic computer science, such as memory allocation.
2. Write programs in C that can relate to physics concepts I’ve learned. Try to solve different physics problems with the programs.

For my IS, I used the following textbooks as references:

King, K. N. *C Programming: A Modern Approach*. 2nd ed. New York: W.W. Norton, 2008. Print.

Vine, Michael A. *C Programming for the Absolute Beginner*. Cincinnati, Ohio: Premier, 2002. Print.

I used these textbooks exactly like a normal class like PHYS 107 uses a large introductory textbook. These books, along with online tutorials and videos, were essential for learning the syntax of C from scratch. While I’ve dealt with other computer programming languages, C is a very low-level language, so it is necessary to understand more about how computers operate. Topics like memory allocation are some of the more challenging parts of learning C. I read the first 19 chapters of the King book, and the entire Vine book (more basic in material). I followed along with each chapter’s sample problems, and tested myself with the “HW problems” like a different physics class would.

**Final Code**: As part of this independent study, I completed a total of 28 C program files, all of which can be compiled and run with linux. I have included two separate code folders, labeled “physics” and “nophysics”. The nophysics folder includes basic programs, starting with as simple as printing hello world, and advancing to a basic tic tac toe program. These programs helped me learn the C syntax and come up to speed with the unique characteristics of C. I spent the first 7-8 weeks of the IS focusing on material independent of physics. After I had understood the basic programming concepts, I moved onto programming problems that would incorporate physics. These code files can be found in the “physics” folder. I finished with a total of 4 different physics programs, which simulate gravity, basic kinematics, projectiles, and collision detection.

**Conclusion**: Overall, this was a very useful IS for me. I enjoyed learning about C, and it helped me understand core programming concepts related to my thesis (programmed in JavaScript, totally different, but still related). It turned out that it took me much more time to learn how to program in C, before I could actually write programs involving much complex physics. If I had more time than 1 semester, I would continue writing more code, and progress with more physics. Thank you Travis for agreeing on this IS during a busy semester for you.