MATH 398 • Special Topics • Spring 2012

Numerical Computing: Discrete Tools for a Continuous World

Many computing algorithms as used in science and technology are based upon the fundamental mathematics of the calculus and linear algebra. Modern computing environments include many of these tools as part of their built-in library of routines. Of essential importance to users are the benchmarking of implementations, selection among multiple variants, and the identification of limitations or failure modes. The latter can be particularly relevant when these routines are called within larger complex codes, or when the limits of extreme system size are encroached upon.

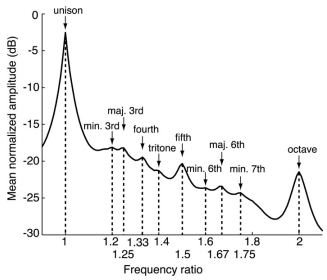
The aim of this course is to give an overview of the common mathematical algorithms used in scientific computing, with particular emphasis on connecting their analytical properties with implementational performance. Numerical routines will be explored and analyzed to their Olympian limits of "faster, larger, more accurate." More mundane questions like, "What are the notes in the opening chord of the Beatles' song, *A Hard Day's Night*?", will also be pondered.

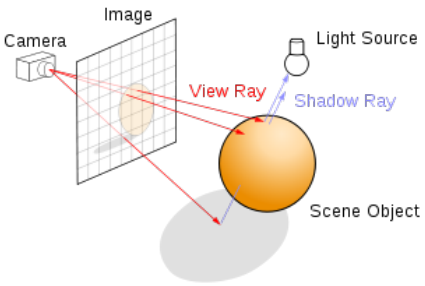
Students are expected to be comfortable with the pre-requisite mathematics, the Calculus of Functions and Linear Algebra; in addition to having advanced programming experience (coding & debugging). The course assignments will be a blending of computation and theory, which serve to illustrate the ideas presented in lecture, and allow prior experimentation with the numerical routines. Matlab will be the default computing environment for the class.

This course can be used in place of MACM 316 for many majors. See the Math Advisor for details.

Calendar course prerequisites: Calc II 152/155/158 and Linear Algebra 232/240. Programming experience (coding & debugging) essential, Matlab will be the course computing environment.

Further information & updates: www.math.sfu.ca/∼muraki





The real world is floating point. The frequencies of music & sound and the geometries of light & colour are two real world experiences that are now routinely encoded into a mathematical existence. So take a pill — preferably the red one.