MACM 316 • Numerical Analysis I • Fall 2014

Numerical Computing: Discrete Tools for a Continuous World

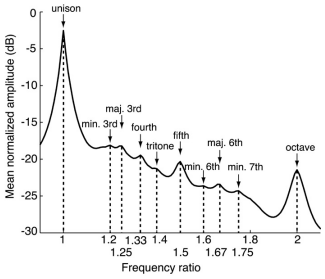
Many computing algorithms used in science and technology are based upon the fundamental mathematics of calculus and linear algebra. Modern computing environments include these tools as part of their built-in library of routines. It is essential that users understand these algorithms for purposes of benchmarking implementations, selecting among multiple variants, and identifying limitations or failure modes. The latter can be particularly relevant when these algorithms are part of larger complex codes or used at the extremes of system size.

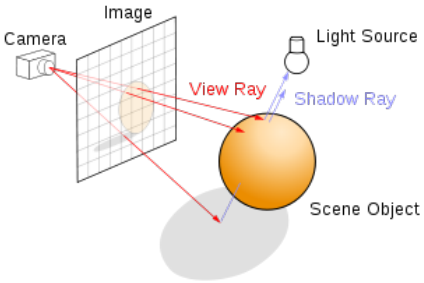
The aim of this course is to give an overview of the common mathematical algorithms used in scientific computing, with particular emphasis on connecting their analytical properties with implementational performance. Numerical routines will be explored and analyzed to their Olympian limits of "faster,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

Students are expected to be comfortable with the pre-requisite mathematics — the Calculus of Functions and Linear Algebra — and be confident with their programming skills (coding & debugging). Course assignments will encompass both theory and computation, which illustrate the ideas presented in lectures, and allow experimentation with numerical routines. Matlab will be the default computing environment for the class.

Calendar course prerequisites: Calc II 152/155/158 and Linear Algebra 232/240. Programming experience (coding & debugging) essential.

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





The real world is floating point. The frequencies of music & sound and the geometries of light & shadow are two real world experiences that are now routinely encoded into a virtual mathematical existence. *After this, there is no turning back . . . You take the red pill - you stay in Wonderland and I show you how deep the rabbit-hole goes.*