Towards an Interval Subroutine Library

George F. Corliss[1], **R. Baker Kearfott**[2], **Ned Nedialkové**[3]
Spencer Smith[4]
[1]Marquette University, Milwaukee, WI
email: George.Corliss@marquette.edu
[2]University of Louisiana at Lafayette
email: rbk@louisiana.edu
[3,4]McMaster University
emails:Nedialk@mcmaster.ca, smiths@mcmaster.ca

Abstract

The interval/reliable/validated computing community has produced many packages for interval arithmetic and many problem-solving routines. For most topics in an elementary numerical analysis book, there is software that successfully solves many problems of modest size in a reliable manner. Yet, if an engineer says, "I *get it.* What software do I use?" there is a long pause, because I have no CD or web site containing a portable, easy to use, comprehensive software library for reliable computations. A group of us are embarking on an long-term effort to assemble such a library from existing software where possible and by enlisting collaborators where new development is necessary.

The library is layered, beginning with a set of Basic Interval Arithmetic Subroutines (BIAS) and interval BLAS (Basic Linear Algebra Subroutines). We have a draft of a portion of the API of that layer. We have dreams of a comprehensive set of utilities such as Taylor models, automatic differentiation, and constraint propagation to support a library of problem-solving routines including linear and non-linear systems, eigenvalues, quadrature, optimization in several flavors, ordinary and partial differential equations, and more.

We seek your advice on the APIs for the BIAS and higher-level routines to follow. What can such a library provide that would make it easier for you to develop reliable engineering applications?

We seek your contributions. What software from your work belongs in such a library?