Implementation of the VAS algorithm in Reduce

Alkiviadis G. Akritas

In this talk we present our implementation of the VAS real root isolation method in the Computer Algebra System Reduce. This was a semester project in the Computer Algebra class of the Department of Electrical and Computer Engineering at the University of Thessaly.

The Reduce programming language is an old one and since it lacks certain features, such as dynamic lists and the statement continue it provided challenges / traps to the students. We describe the interfaces we used, namely TeXmacs and the standard Terminal, and state their weak points. The end-product is the file VAS.red that can be downloaded from the site http://inf-server.inf.uth.gr/akritas/VAS.red

VAS.red can be used both in batch and in compiled mode (instructions on the usage can be found inside VAS.red itself).

For the approximation of the roots we have two procedures: vas_realroots and vas_realroots2.

The first one, vas_realroots, uses the (algebraic) procedure rfind which serves as an interface to the Reduce (symbolic) procedure rootfind; in this case the user has to set the desired precision.

The second approximation procedure, vas_realroots2, uses the Reduce (algebraic) function nearestroot, which automatically adjusts the precision; however, in this case it was necessary to implemented certain (time wasting) tricks to make it always converge to the desired root.

In both cases, the obtained results are exactly the same as those computed with Reduce's own realroots function.
Alkiviadis G. Akritas
University of Thessaly,
Department of Electrical and Computer Engineering
Volos, Greece
e-mail: akritas@uth.gr