

Implementation of the VAS algorithm in Maxima

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

The Maxima 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, wx-Maxima and the standard Terminal, and state their weak points. The end-product is the file VAS.mac that can be downloaded from the site

<http://inf-server.inf.uth.gr/~akritas/VAS.mac>

VAS.mac can be used both in batch or compiled mode (instructions on the usage can be found inside VAS.mac itself). It should be noted that during the translation/compilation process we discovered three compiler bugs, namely

- <http://sourceforge.net/p/maxima/bugs/2569/>, as a result of which we used the `rat` function with only one argument,
- <https://sourceforge.net/p/maxima/bugs/2576/>, as a result of which we used the function `ratdisrep(...)` in certain `if` statements to convert a Canonical Regular Expression (CRE) to a General Expression (GE), and
- the compiler does *not* like functions names with mixed-case letters, as a result of which we used all lower case names.

For the approximation of the roots we used the function `bzero` — downloaded from the Maxima archives (for the year 2007) which can be found at the site <http://www.math.utexas.edu/mailman/listinfo/maxima> — which uses Brent's algorithm to compute a root within an interval (l, r) . The obtained results are exactly the same as those computed with Maxima's own `realroots` function.

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