

Re: Steps towards writing a computer algebra system

Source: <http://sci.tech-archive.net/Archive/sci.math.symbolic/2005-01/0133.html>

From: Julian V. Noble (jvn_at_virginia.edu)

Date: 01/18/05

Date: Tue, 18 Jan 2005 18:38:56 -0500

Mike wrote:

>

> *Hi*

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> *I am a self-taught programmer and have always been fascinated with*
> *computer algebra systems (CAS) such as Mathematica. For a hobby I*
> *thought that I would like to have a crack at writing my own (very*
> *simple) CAS but I am rather lost on where to start.*

>

Start by writing code to translate algebraic formulas to some useful internal representation. I have written a fairly elaborate one in Forth (translates a formula to Forth in usual Forthish RPN form) but there is no reason you have to make Forth the parse language, or Forth the output language, for that matter. Lisp, C, C++ or AWK would do fine for the parse language, and assembler or pseudocode, or even a tree structure would be fine for the target "language". I believe Kruse ("Data Structures and Program Design") has a program for evaluating numerically an input formula. That should serve as a guide to how to do it. Several of my Forth FORMula TRANslators can be found at

<http://Galileo.phys.Virginia.EDU/classes/551.jvn.fall01/programs.htm>

You will have to learn how to write finite state machines in whatever language you choose, unless it has built-in pattern recognizing functions.

Once you can do this, think how to write out the rules for some algebraic transformation, such as factoring out a common sub-expression, or solving a linear or quadratic equation in closed form. Then write pseudocode to translate the rules into an algorithm. At this point you will have begun to understand what goes into a real CAS.

If you are interested in integer computations, learn how to do arithmetic with integers of arbitrary length. See Knuth, e.g. for algorithms. You will need to learn how to represent very large integers compactly. Knuth offers some insight on this.

sci.math.symbolic: Re: Steps towards writing a computer algebra system

Good luck.

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"As democracy is perfected, the office of president represents, more and more closely, the inner soul of the people. On some great and glorious day the plain folks of the land will reach their heart's desire at last and the White House will be adorned by a downright moron."

--- H. L. Mencken (1880 - 1956)