Subject: Roots of characteristic equation (smart root-finding)
Posted by Marty Ryba on Wed, 15 Oct 1997 07:00:00 GMT
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Hello,

I wonder if anyone has any routines/suggestions for my problem:

I am trying to examine the stability of a linear oscillator with time lag, which therefore has a nonlinear characteristic equation (there are exponentials exp(-lambda*tau) in it). As you may know, the roots of the characteristic equation correspond to solutions of the differential equation, and therefore the value of these roots are very important for assessing stability, etc. Anyway, I'm trying to evaluate stability (whether the real part of the root is positive or negative) for a wide range of parameters of the system (computing a bunch of roots and plotting the contour between positive and negative real components). I've been using the routine FX_ROOT but I'm having problems in that it doesn't reliably find the maximal root (the one with the most positive real component). It happily finds any old root, sensitively dependent on the location of the initial guesses. I could conceivably take the complex equation and convert it into a pair of equations and use AMOEBA, NEWTON, or BROYDEN, but I still have the problem of needing "good" guesses; I could perform a coarse grid search first, but the equations are very sensitive to changes in the imaginary component of the root, so the grid would need to be rather fine and I would need to intelligently find the local minimum of the magnitude with the most positive real compenent.

Any tips/suggestions?

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Dr. Marty Ryba | Of course nothing I say here is official
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| blah, blah, blah, ...