Re: solving two of nonlinear equations and two unknwons.

Source: http://sci.tech−archive.net/Archive/sci.math.num−analysis/2008−10/msg00172.html

---

- *From*: spellucci@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx (Peter Spellucci)
- *Date*: Fri, 17 Oct 2008 15:42:29 +0200 (CEST)

In article <79d4b9a3−85b1−4401−9f4b−bedc72eefa4c@xxxxxxxxxxxxxxxxxxxxxxxxxxxxx>,
Mike <SulfateIon@xxxxxxxxx> writes:

> Hi
>
> I have a problem about solving two of nonlinear equations. And I only
> have two unknown.
> The function is run by some complex program and I think it's very hard
> to solve it analytically.
> Thus, I cannot have anallytic Jacobian.
> I try numerically. I use IMSL and fortran.
>
> First I use NEQBF(purpose:Solves a system of nonlinear equations using
> factored secant update with a finite−difference approximation to the
> Jacobian.). Then I find there is no constraint (reasonable bounds)
> for this.
> Does anybody know if there is constrainted nonlinear equations solver
> for imsl?
>
> Then I switch to use BCLSF(purpose:
> Solves a nonlinear least squares problem subject to bounds on the
> variables using a modified
> Levenberg−Marquardt algorithm and a finite−difference Jacobian.)
> It is quite sensitive to guess vectors. It traps to a wrong solution.
> Since I have two unkown for two nonlinear equations. I doubt if I
> need to use this (least squares).
>
> Is there a better choice for IMSL fortran?
>
> Mike

if I understand this and the postings following this then
. you have a system f1(x,y)=0 f2(x,y)=0
searching for a solution in a given box
. f1 and f2 are computed by a complicated black box system
and you have only function values available

. you are using codes which try to approximate derivatives (Jacobians)
using finite differences

your question concerning "good digits in f" : this means an estimate of the number of (decimal) digits in the computed function values which are exact. this is needed in devising a senseful numerical derivative.
maybe all the failures you report are simply due to the fact that
the output of your black box is low precision thereas the software you are using assumes, if not told otherwise, that the function values are correctly rounded. this would yield horribly wrong derivatives and hence chaotic behaviour.
maybe this is expensive, but have you made a plot of your two functions over your box in order to get a crude idea about the solution?
next proposal would be to use minimization of the sum of squares
f1^2+f2^2 over the box using a derivative free code
for example bobyqua by M.J.Powell, or a (mathematically correct version of) Nelder−Mead code.

hth
peter

.