Subject: Re: how to solve a equation set automatically in IDL?
Posted by Wout De Nolf on Fri, 05 Jun 2009 08:07:30 GMT
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On Thu, 4 Jun 2009 09:29:12 -0700 (PDT), Hu <jhaohu@gmail.com> wrote:

> Hi, there
>
> I wonder whether there is some automatic method / function in IDL to
> solve an equation set.
>
> Supposing that I got an equation like: A*x+B*y+C*z=E*m+F*n , and
> I got five sample points (xi,yi,zi,mi,ni), (1<= i <=5). well, I can
> solve the equation set (including 5 equations) mathematically and got
> value for parameter A,B,C,D,E.
>
> How can I do it automatically without listing the expressions like A=f
> (x,y,z,m,n), B=f(x,y,z,m,n), C=f(x,y,z,m,n)...?
>
> Thanks

So you're trying to solve a linear system of equations, right?

In your example, [A,B,C,E,F] are the unknows? Then for one equation:

```
        A*x+B*y+C*z = E*m+F*n
<=>   A*x+B*y+C*z-E*m-F*n = 0
<=>  [x,y,z,-m,-n]##transpose([A,B,C,E,F])=0
```

And for several equations:

```
M = [[x0,y0,z0,-m0,-n0],$
      [x1,y1,z1,-m1,-n1],$
      ...]
X = transpose([A,B,C,D,E])
M ## X = 0
```

You can solve this numerically in many ways (e.g. use SVDC + SVSOL).
However, this is a homogeneous system of equations, so there are two
possibilities for the solution X:
1. There is only 1 solution: X = 0
2. There are an infinite number of solutions, namely the Null space
(or kernel) of the matrix M

So you find a solution X by finding the Null space of M. You can do
this using SVD:

```
; Decompose M:
SVDC, M, W, U, V
```

; Find the null space of M (i.e. columns of V corresponding with
zero-valued singular values W)
pres=(machar(double=double)).eps
indNull=where(abs(W) le pres,nullity)
if nullity ne 0 then X = V[indNull,*] $
else X = V[0,*]*0

When the nullity is not zero, X contains a basis for the infinite set
of solutions. For example, nullity=2:
set of solutions = a.X[0,*] + b*X[1,*] (where a and b is any real
number)

Does this help?

Subject: Re: how to solve a equation set automatically in IDL?
Posted by Hu on Fri, 05 Jun 2009 13:50:49 GMT
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On Jun 5, 4:07 am, Wox <s...@nomail.com> wrote:
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> number)
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> Does this help?

Yes, it's really helpful. thank you.
