Subject: Re: matrix log and exp
Posted by jeyadev on Thu, 18 Apr 2002 19:39:38 GMT
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In article <a9kgr4$ur8$1@scavenger.euro.net>,
G Karas <jacobianat@gmx.net> wrote:
> Hi group,
> one quickie and possibly difficult:
>
> IDL does not have a matrix logarithm logm and matrix
> exponent expm function. I was thinking of calling lapack
> routines which do it, but have no experience with lapack
> or FORTRAN. Anyone with any tips on this one?

It depends on the matrix. Can you diagonlise it? It so,
you are done. You will need a support package to do the
linear algebra, though.

If A is the matrix and you need exp(A), you proceed as
follows:

1. Find the eigenvalues and eigenvectors of A

   such that A u_i = l_i u_i

   where u_i is the i-th eigenvector and l_i is the
   corresponding eigenvalue

2. Form the 'rotation' matrix R = [u_1 u_2 ....]
   where each e.vector becomes a column. The R' be
   the transpose of A.

   Now, the product R A R' is a diagonal matrix
   with the eigenvalues l_i as its diagonal elements.
   Its exponetial is just the diagonal matrix with
   elements that are exp(l_i).

   What you have done is find the exponential of the
   matrix in the representation in which the original
   A is diagonal. Call this diagonal matrix B.

   B_ij = exp(l_i) d_ij

   where d_ij is the Kronecker delta symbol.

3. Then, exp(A) = R' A R

The trick is to do the basic operation in the diagonal representation and then transform back. If you can write the operation as a power series, then can see why this works.

The same should work for the logarithm, if the e.values are all greater than zero.

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