
Subject: Re: pseudo code for doing SVD on 2D sparse array
Posted by [Brian Borchers](#) on Sun, 21 Dec 2008 14:46:45 GMT
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On Dec 21, 4:41 am, erano <eran.o...@gmail.com> wrote:

> Hi,
> I wish to solve $Ax=B$
> A is sparse array (size $m \times n$), in format of [x_index, y_index, value]
> B is vector length m
> x is unknown vector length n
> $n=1,000,000$
> $m=2 \times n$
>

The title of your posting refers to the SVD, but the body of the posting indicates that you want to solve a linear system of equations, perhaps in the least squares sense.

Unfortunately, computing the SVD of your 2,000,000 by 1,000,000 sparse matrix is utterly impractical- it would require the storage of a 1,000,000 by 1,000,000 fully dense matrix and a 2,000,000 by 2,000,000 fully dense matrix, which would take up about 2.4×10^{13} bytes of storage...

Finding a least squares solution to the system of equation should probably be done using an iterative method such as lsqr. In order to do this, you'll first want to convert your data into a MATLAB sparse matrix with

```
As=sparse(A(:,1),A(:,2),A(:,3));
```

Then solve with

```
x=lsqr(As,b);
```

Since your matrix is extremely large, this could take a long time or simply fail to converge. If so, you might want to loosen the default tolerance, introduce a preconditioner, etc. The documentation on lsqr explains how to do these things.
