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/*=====
linalg.c

Version 1.0

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Revised:
=====*/

#if defined(PremiaCurrentVersion) && PremiaCurrentVersion < (2008+2) //The "#els
#else

#include <math.h>

#include "nrutil.h"

//double determinant(double **a, int n)

// inverse(double **a, int n)

//NUMERICS_EXPORT BOOL linsolve(double **m, double *b, int n, int method)

// void lubksb(double **m, int n, int *indx, double *b)

// ludcmp(double **m, int n, int *indx, double *d)

void matmat(double **a, int nra, int nca, double **b, int ncb, double **prod)
```

```
{
    int i, j, k;
    double sum;

    for (i = 0; i < nra; i++)
    {
        for (j = 0; j < ncb; j++)
        {
            sum = 0.0;
            for (k = 0; k < nca; k++)
            {
                sum += a[i][k] * b[k][j];
            }
            prod[i][j] = sum;
        }
    }
}

void matvec(double **a, int nra, int nca, double *x, double *b)
{
    int i, j;
    double sum;

    for (i = 0; i < nra; i++)
    {
        sum = 0.0;
        for (j = 0; j < nca; j++)
        {
            sum += a[i][j] * x[j];
            // sum += a[i][j] * x[j];
        }
        b[i] = sum;
    }
}

void transpose(double **a, int nr, int nc, double **at)
{
    int i, j;

    for (i = 0; i < nr; ++i)
    {
```

```
        for (j = 0; j < nc; ++j)
        {
            at[j][i] = a[i][j];
        }
    }
}

void vecmat(double *x, double **a, int nra, int nca, double *b)
{
    double **t = dmatrix(0, nca - 1, 0, nra - 1);

    transpose(a, nra, nca, t);
    matvec(t, nca, nra, x, b);

    free_dmatrix(t, 0, nca - 1, 0, nra - 1);
}

double vecvec(double *first1, double *last1, double *first2)
{
    double p = 1.0;

    while (first1 < last1)
    {
        p += *first1 * *first2;
        ++first1;
        ++first2;
    }

    return p;
}

void pairwdiff(int n, double *x, double *y, double **dest)
{
    int i;
    int j;

    for (i = 0; i < n; ++i)
    {
        for (j = 0; j < n; ++j)
        {
            dest[i][j] = x[i] - y[j];
        }
    }
}
```

```
    }  
  }  
}
```

```
/*=====
Revision History

Version 1.0 - 08/28/1998 - New.
=====*/

#endif //PremiaCurrentVersion
```