MQSI: Monotone Quintic Spline Interpolation

The package MQSI is a collection of Fortran 2003 routines for the construction of a C^2 monotone quintic spline interpolant Q(X) to data (X(I),F(X(I)), with the property that Q(X) is monotone increasing (decreasing) over the same intervals [X(I), X(J)] as the data F(X(.)) is monotone increasing (decreasing). All routines use the module REAL_PRECISION from HOMPACK90 (ACM TOMS Algorithm 777) for specifying the real data type.

The physical organization into files is as follows.

* The file 'REAL_PRECISION.f90' contains the module REAL_PRECISION.

* The file 'MQSI.f90' contains the subroutine MQSI, which computes a C^2 monotone quintic spline interpolant to data in terms of a B-spline basis, matching the monotonicity of the data.

* The file 'SPLINE.f90' contains the subroutines FIT_SPLINE for constructing a B-spline basis representation of an osculatory spline Q(X) interpolating F(X), F'(X), ..., F^{(NCC-1)}(X) for NCC continuity conditions at each breakpoint X(K), and EVAL_SPLINE for computing the value, derivatives, and integral of Q(X).

* The file 'EVAL_BSPLINE.f90' contains the subroutine EVAL_BSPLINE, a Fortran 2003 implementation of the B-spline recurrence relation evaluation code by C. deBoor for the value, derivatives, and integral of a B-spline.

* The files 'blas.f' and 'lapack.f' contain just the necessary BLAS and LAPACK routines, in case the complete BLAS and LAPACK libraries are not available.

To compile and link, use the command:

```
$F03 $OPTS REAL_PRECISION.f90 EVAL_BSPLINE.f90 SPLINE.f90 MQSI.f90 \
   $MAIN -o $EXEC_NAME $LIB
```

where '$F03' is the name of the Fortran 2003 compiler, '$OPTS' are compiler options such as '-O3', '$MAIN' is the name of the main program, '$EXEC_NAME' is the name of the executable, and '$LIB' provides a flag to link BLAS and LAPACK. If the BLAS and LAPACK libraries are not available on your system, then replace $LIB with the filenames 'blas.f lapack.f'; these files contain the routines from the BLAS and LAPACK libraries that are necessary for this package.

This package includes a sample main program in the file 'sample_main.f90' illustrating the use of an input data file 'sample_main.dat', and an extensive test suite in the file 'test_all.f90', all of which can be compiled and linked as above.

Inquiries should be directed to Thomas C. H. Lux (tchlux@vt.edu).