ALGORITHM 660
QSHEP2D: Quadratic Shepard Method for Bivariate Interpolation of Scattered Data

ROBERT J. RENKA
University of North Texas

Categories and Subject Descriptors: G.1.1 [**Numerical Analysis**]: Interpolation; G.4 [**Mathematics of Computing**]: Mathematical Software

General Terms: Algorithms

Additional Key Words and Phrases: Cell technique, closest point problems, local interpolation, multivariate interpolation, nearest-neighbor searching, scattered data interpolation, smooth interpolation, surface fitting

QSHEP2D is an implementation of the modified quadratic Shepard method [1] for the case of two independent variables. The software conforms to both the 1966 and 1977 (Subset) ANSI Standards for FORTRAN, and has no system dependencies. Header comments in each routine contain detailed descriptions of the calling sequences, and all parameter names conform to the FORTRAN typing default.

The primary purpose of the package is to construct a once-continuously differentiable function $Q(X, Y)$ such that Q interpolates a set of N data values F_i at arbitrarily distributed nodes (X_i, Y_i) for $i = 1, \ldots, N$. Also, two of the subroutines, STORE2 and GETNP2, may be used alone to solve closest point problems.

The user-callable modules are as follows:

QSHEP2: A subroutine that computes the parameters defining $Q(X, Y)$;
QS2VAL: A function that returns a value of Q at an arbitrary point;
QS2GRD: A subroutine that evaluates Q and its first partial derivatives at an arbitrary point;
STORE2: A subroutine that computes and stores the data structure for cell-based searching; and
GETNP2: A subroutine that returns the nearest unmarked node, along with its squared Euclidean distance, to an arbitrary point, and marks the node (so that a subsequent call will return the next closest node).

Author's address: Department of Computer Science, University of North Texas, P.O. Box 13886, Denton, TX 76203.

QSHEP2 calls STORE2 and GETNP2 to find sequences of nearest neighbors to each node. Three additional subroutines are called by QSHEP2 to set up and solve the least squares systems for the coefficients defining Q. The remaining modules call no other routines.

REFERENCE

1. RENKA, R. J. Multivariate interpolation of large sets of scattered data. *ACM Trans. Math. Softw. 14*, 2 (June 1988), 139–148.

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