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Computational Geometry 7 (1997) 1–2

Computational Geometry
Theory and Applications

Foreword

The Fifth Canadian Conference of Computational Geometry was held 5–9 August 1993, in Waterloo, Ontario, Canada. Over 120 people attended the conference. There were 78 contributed papers presented at the conference, as well as five invited lectures. This special issue of *Computational Geometry, Theory and Applications*, contains the final versions of nine of the papers from CCCG93, including a paper containing the material presented by C. Yap, who delivered one of the invited lectures.

The nine papers cover a wide range of topics in computational geometry, including Voronoi diagrams, space partitions, combinatorial geometry, structure of polygons, triangulations, robustness, and geometric pattern matching.

The first paper, by C.-K. Yap, examines the practical support needed to make the exact computation approach to geometric algorithms a viable alternative to floating point arithmetic, with its inherent problems of robustness. The stated goals are: to improve the practical cost of exact computation; and to study the inherent tradeoffs between speed and precision, between fixed-precision and exact computation.

The second paper, by V.J. Milenkovic and V. Milenkovic, presents several algorithms for approximating an orthogonal rotation matrix in three dimensions by an orthogonal matrix with rational entries. Applications to solid modeling are described.

The third paper, by G. Das, P.J. Heffernan and G. Narasimhan, presents a linear time algorithm to compute all the pairs s, t of points on a polygon boundary with the property that any point on the chain from s to t sees a point on the chain from t to s and vice versa. These are called the points that admit *LR-visibility*, and are of interest for the two-guarding problem.

The fourth paper, by J.-M. Robert, examines the existence of a line transversal of a set of translates of convex objects in the plane. Bounds are given on the number of geometric orderings induced by the line transversals.

The fifth paper, by L.P. Chew, proves for the L_1 metric, the widely held belief that the number of topological changes to the Voronoi diagram of n points moving with constant velocities is close to n^2.

The sixth paper, by M. de Berg, M.M. de Groot and M.H. Overmars, constructs (if one exists) a perfect binary space partition for n non-intersecting line segments. The authors present a scheme for recursively dividing the configuration of line segments by hyperplanes until all the segments are separated, but none is cut.

The seventh paper, by S.A. Mitchell, gives an algorithm to find a *covering triangulation* of a planar straight-line graph or a polygon with holes, with a provable bound on the minimum angle used. A *covering triangulation* is a triangulation in which Steiner vertices are allowed, but not on the edges of the graph or polygon. These are useful for triangulating intersecting regions independently, and for some mesh generation problems.

SSDI 0925-7721(95)00039-9

The eight paper, by L.P. Chew, M.T. Goodrich, D.P. Huttenlocher, K. Kedem, J.M. Kleinberg and D. Kravets, examines the problem of determining whether a planar set A can be transformed by an Euclidean motion to *match* another planar set B, in the sense that each member of A is within distance ε from a member of B. This problem is central to computer vision.

The ninth paper, by K. Daniels, V. Milenkovic and D. Roth, gives a close-to-linear time algorithm to find the maximum area axis-parallel rectangle in a polygon. This problem arises in applications where an inexpensive internal approximation to a polygon is desired.

We would like to thank all the referees of this special issue for their time and effort, and the contributors for making this special issue possible.

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September 1995