

# Experiences with the Implementation of Geometric Algorithms

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We review some of the experiences made with the implementation of geometric algorithms in LEDA, in particular with the problems of degeneracy and precision, and report on the conclusions that we have drawn from these experiences.

- We handle degeneracies as first class citizens, i.e., before starting to implement an algorithm we redo the theory so as to include degenerate cases.
- We implement all basic primitives using exact arithmetic. To gain speed we use floating-point filters.
- We added several data types to LEDA to support the preceding item: bigints, rationals, bigfloats, reals (the rationals closed under square roots), points and hyperplanes with rational coordinates and coefficients, linear algebra over the integers. Some of these classes incorporate a floating point filter in a way transparent to the user.
- We implemented algorithms for line segment intersection, 2d and 3d convex hulls, 2d Voronoi diagrams of points, and convex hulls (in arbitrary dimension) using these primitives.
- We are working on a program for Voronoi diagrams of line segments. This involves exact computation with algebraic numbers (class real mentioned above).

## References

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