Effective Computational Geometry
References for Nef Polyhedra

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Definition and Theory of Nef Polyhedra

A good detailed introduction with examples is in Bieri's paper [Bie95]. Good but compact introductions are in Dobrindt's et al. publication [DMY93a] (also appeared as technical report [DMY93b]), and in Michael Seel's PhD thesis describing (among others) the 2D Nef implementation and infimaximal frames [See01b], or his detailed technical report that contains the full implementation and its documentation [See01a]. The original foundation is from Walter Nef with his (German) book [Nef78].

Edge-based Data Structures for 2D Nef

The overview presented in class can be found in my paper [Ket99]. The original references for the various data structure are: Winged edge data structure [Bau75] and original DCEL (doubly connected edge list) [MP78]. Halfedges [Wei85, Män88] and current understanding of DCEL [dBvKOS97]. Quad-edge data structure [GS85].

C++ Template Techniques

The material presented was (mostly) taken from my course notes of an Algorithm Library Design Course, see `<http://www.mpi-sb.mpg.de/~kettner/courses/lib_design/notes/>`. For the Standard Template Library the online documentation `<www.sgi.com/tech/stl/>` can be recommended as well as the good book by Austern [Aus98]. More references are also in my lecture notes. The full design for a halfedge data structure is described in one of my papers [Ket99].

Infimaximal Frames

Taken from the technical report by Michael Seel and Kurt Mehlhorn [SM00].

Implementation of 2D Nef

The implementation of 2D Nef in CGAL by Michael Seel is described (among others) in his PhD thesis [See01b]. It contains, for example, the infimaximal frames, the sweep line algorithms for the overlay computation, the simplification algorithm, etc. The detailed technical report contains the full implementation and its documentation [See01a]. The union-find data structure and its analysis are in standard text books such as Corman et al. [CLR90].

Representations for 3D Nef

Dobrindt et al. [DMY93a, DMY93b] describe a data structure similar to the sphere map (SM) data structure. Gursoz et al. [GCP90] describe earlier a data structure that similarly records the complete topology in the neighborhood of vertices. They also point out (with example) why the radial edge data structure by Weiler [Wei88] is not sufficient in describing topology. Selective geometric complexes (SGC) by Rossignac and O'Connor are similar to Nef, but for general semi-algebraic varieties [RO89]. If we assume halfspaces as varieties, we get the connected components of Nef faces as cells in their data structure. Unfortunately the paper lacks some details.

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