Effective Computational Geometry
Exercise 11

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Exercise 1: (20 pts)

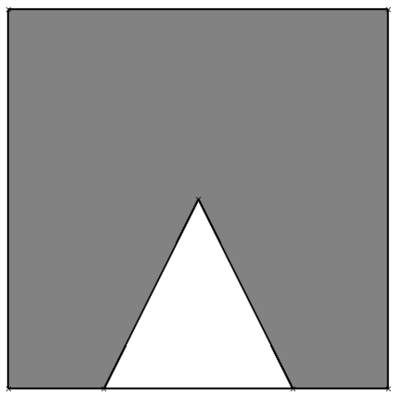
A set $K \subseteq \mathbb{R}^d$ is a *cone with apex* x iff $K = x + \lambda(K - x)$ for all $\lambda > 0$. We define the set $T(K) \subseteq \mathbb{R}^d$ of *translations* for which $K = K + t$ for all $t \in T(K)$ holds. Prove that $T(K)$ is a linear vector space. (Note that $x + T(K)$ is the set of all apices of the cone K and this proof implies that the set of all apices is an affine subspace.)

Exercise 2: (30 pts)

Make yourself comfortable with CGAL. It is located in `/KM/projects/CGAL`. The following subdirectories are all local to that path. The online manuals are accessible from `doc_html` or from `http://www.cgal.org/Manual/doc_html/`.

Copy the examples file `nef_2d.C` and the corresponding `makefile` from the course web page. Set the environment variable `CGAL_MAKEFILE` to the filename (including path) of the makefile in the `make` subdirectory that is suitable to your machine (and with the `_LEDA` suffix). Compile and run the example program. Study it with the help of the User and Reference Manual Pages for *Planar Nef Polyhedra*. See how the visualization changes when you switch from a closed to an open set.

Starting from the example program, modify it to create the following closed Nef polyhedron. Turn in the source code of the program as solution. Furthermore, how many edges does this Nef-polyhedron have in the Würzburg structure and how many edges are stored in the representation chosen in CGAL?



Solutions are due February 14th, 2002. Solutions will be discussed in the tutorials of the week after.