

## Programming Assignment (optional)

due: May 17th, 2010

We encourage you to complete this assignment. It will account for 20% of your final grade, provided that it increases the grade. Please submit this assignment directly to Efi Fogel. Further details will be given in the course website.

**Exercise:** Develop a function template called `triangulate()` that triangulates arrangements using the regularization and triangulation stages introduced by Preparata and Shamos [3]; see also [1, Section 25.2] for a summary. This algorithm is very similar to the one presented in class [2] for a single polygon.

The function accepts an arrangement  $A$  of segments as input. It inserts pairwise interior-disjoint segments into the arrangement that triangulate all the bounded faces of  $A$ . It consists of two steps. First, it inserts the appropriate segments to make all bounded faces  $x$ -monotone. Then, it inserts the remaining segments, which complete the triangulation.

Use the following declaration:

```
template <typename Arrangement> void triangulate(Arrangement& arr);
```

When the function template is instantiated the `Arrangement` template parameter must be substituted with an instance of the `CGAL::Arrangement_2<Traits,Dcel>` class-template.

Develop a simple `main()` function that reads an arrangement stored in an input ASCII file, issues a call to an instance of the `triangulate()` function-template, and writes the resulting arrangement to the standard output stream.

The implementation must handle all degeneracies. Examples of input files will be distributed later on through the course website.

## References

- [1] M. Bern. Triangulations and mesh generation. In J. E. Goodman and J. O'Rourke, editors, *Handbook of Discrete and Computational Geometry*, chapter 25, pages 529–582. Chapman & Hall/CRC, Boca Raton, FL, 2nd edition, 2004.
- [2] J. O'Rourke. *Computational Geometry in C*. Cambridge University Press, New York, NY, 2nd edition, 1998.
- [3] F. P. Preparata and M. I. Shamos. *Computational Geometry: An Introduction*. Springer-Verlag, New York, NY, 3rd edition, 1990.