

# Glossary

**$\alpha$ -shape** The  $\alpha$ -shape is a generalization of Delaunay triangulation [25]. The  $\alpha$ -shape of a set of points  $P$  is obtained from its Delaunay triangulation by removing the elements (edges, triangles and tetrahedrons) that cannot be inscribed in a sphere of radius  $\alpha$ .

**Convex hull** The *convex hull* of a set of points  $P \subset R^D$  is the intersection of convex subsets of  $R^D$  that contain  $P$ . For a finite set of points in  $R^2$ , the convex hull is the convex polygon of minimum area that contains the points. The vertices of the convex hull are a subset of  $P$ .

**Delaunay triangulation** The Delaunay triangulation of a set of points  $P$ , is composed by triangles (tetrahedrons in three dimension) that have as vertices the points of  $P$ , such that there are not vertices lying in the spheres circumscribed to the triangles.

**Genus** A topologically invariant property of a surface defined as the largest number of non intersecting simple closed curves that can be drawn on the surface without separating it. Roughly speaking, it is the number of holes in a surface.

**Manifold** A manifold is a topological space which is locally Euclidean (i.e., around every point, there is a neighborhood which is topologically equivalent to the open unit ball in  $R^n$ ).

**Marching Cubes** The *Marching Cubes* [154] is an algorithm for the approximation of isosurface in volumetric data. Each cube is characterized by the values of the vertices that represent the voxel. For a user defined threshold, if a cube has some vertices over threshold and some others under threshold, the isosurface of value equal to threshold pass through the cube. Determining the vertices of the cube that belong to the isosurface, it is possible to create triangular patches that divide the cube in regions internal and external to the isosurface. The representation of the surface is generated connecting the obtained triangular patches.

**Octree** An *octree* is a tree data structure where each node has eight children. Each node of the octree represents a cube in the three-dimensional space. Each child represents an eighth of the volume of the father node. This data structure is used for the search of points belonging to a region of the space, since it allows a logarithmic access time/cost to the data of the set.

**Voronoi diagram** The Voronoi diagram of a set of points  $P \subset R^D$  is a partition in regions of the space determined by  $P$ . For each  $p \in P$ , the corresponding region is determined as the collection of the points in  $R^D$  that are closer to  $p$  than to any other point in  $P$ .

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