

Conclusions

In this work we have commented some geometrical and topological aspects related to the n-Dimensional Polytopes (Chapter 2 and Chapter 4) and three methodologies for their visualization: through their unravelings, through their intersections with 3D space and through their projections to 3D and 2D spaces (chapter 3). We described three schemes for the representation of n-Dimensional Polytopes: n-Dimensional Boundary Representations, n-Dimensional Hypervoxelizations and 2^n -trees (Chapter 6).

We will now comment some of the contributions that this work have provided. In first place it was presented the “Test-Box” heuristic that provides a solution to the problem of determining the configurations that can represent the nD Orthogonal Pseudo-Polytopes (Chapter 5). There are presented some formulations that describe properties of the proposed heuristic and these configurations. Through our procedure we found 20,983 configurations for the 5D Orthogonal Pseudo-Polytopes and 15,440,344 configurations for the 6D Orthogonal Pseudo-Polytopes under a temporal complexity that is better than the exhaustive searching procedure.

Another contribution is the first approach for the extension of the Extreme Vertices Model (EVM), presented by Aguilera & Ayala, to the 4D and 5D spaces (Chapter 7). Our current experimental results provide a representation model for 4D and 5D Orthogonal Polytopes, which supply us a tool to perform geometrical and Boolean operations on these

Polytopes. Although we have defined a Polytopes' representation model in a purely four-dimensional and five-dimensional geometric fashions, it doesn't limit our research because it can be applied over geometries like the space-time.

Two applications for the extensions to the 4D and 5D spaces of the Extreme Vertices Model and the n-Dimensional Representation Schemes complete our set of contributions:

- Application 1: Representation of multimedia content, specifically color 2D and 3D-animations, through 4D and 5D Orthogonal Polytopes.
- Application 2: Visualization and analysis of geographical data (from Popocatepetl volcano) through the extrusions to the 5D colorspace of 2D-color images.