



Parallel Coordinates: *Visual* Multidimensional Geometry and its Applications

Alfred Inselberg

School of Mathematical Sciences

Tel Aviv University

aiisreal@post.tau.ac.il * www.cs.tau.ac.il/aiisreal

&

Senior Fellow San Diego Supercomputing Center

Abstract

With Parallel Coordinates the perceptual barrier imposed by our 3-dimensional habitation is breached enabling the visualization of multidimensional problems. The foundations are intuitively developed interlaced with applications and interactive demonstrations. A powerful knowledge discovery process enables the exploration of multivariate data with stunning results. The patterns representing relational information reveal properties, like convexity and non-orientability, of hypersurfaces unlocking new geometrical insights. Models of multivariate problems allow for the exploration of interrelations among parameters, sensitivities, trade-offs and constraints for decision making. These patterns persist in the presence of errors and that is good news for the applications. We stand at the threshold of cracking the gridlock of multidimensionality. The parallel coordinates methodology is used in collision avoidance and conflict resolution algorithms for Air Traffic Control (3 patents), Computer Vision (patent), Data Mining (patent), optimization and process control.