

# SplineSOM

## From Nointrigue

This is a copy (with modified links) of <http://wiki.vislab.usyd.edu.au/moinwiki/SplineSOM>, which is not publicly readable.

Self-organising maps (SOMs) can be used to represent high-dimensional data in lower dimensions, such as a 2D screen. After training, cells close to a particular cell will recognise similar inputs; that is, cells that recognise similar inputs are clustered together. Finding the shortest distance between cells cannot be done by simply calculating the number of cells along the path; instead, we must consider the distance between cells in the original number of dimensions. Straight lines can be used to join the cells in the original number of dimensions, but this results in an unnatural path. Splines can be used as a better approximation of the actual distance between the two cells. As a visualisation tool, grid of cells can be visualised as a terrain, where longer distances between two adjacent cells are represented by a hillier terrain. The task is to find ways to calculate this distance on such a terrain.

A second, side task is, given a icosahedron-based tessellation of a sphere, to find a way to allow one to iterate through all vertices within a given radius of a given point, using asymptotically linear time and space. This will involve indexing of some description.

## Contents

- People
- Documentation
  - Papers and readings
    - Splines for self-organising maps
    - Indexing icosahedrons
  - Notes
  - Presentation
- Code
  - Instructions

## People

This project was undertaken during a summer scholarship for 2006-7.

- Supervisor: Masa Takatsuka (<http://www.cs.usyd.edu.au/~masa/>)
- Researcher: Enoch Lau

## Documentation

### Papers and readings

#### Splines for self-organising maps

12/08/2009

SplineSOM - Enoch Lau's wiki

- Yingxin Wu and Masahiro Takatsuka, "Spherical self-organising map using efficient indexed geodesic data structure", Neural Networks 19 (2006) 900-910
- E. B. Saff and A. B. J. Kuijlaars, "Distributing many points on a sphere", Springer-Verlag New York, Volume 19, Number 1, 1997

### Indexing icosahedrons

- Teuvo Kohonen, "The Self-Organizing Map", Proceedings of the IEEE, Vol. 78, No. 9, September 1990
- John W. Sammon, Jr., "A Nonlinear Mapping for Data Structure Analysis", IEEE Transactions on Computers, Vol. C-18, No. 5, May 1969

### Notes

- You can get my final set of notes (summary, discussion of major issues and innovations, limitations of current work, future extensions) here

### Presentation

- Talk files: pdf and pptx

### Code

You can also download the final snapshot as an archive: tgz and zip

### Instructions

- Open in NetBeans and run, or if you don't have NetBeans, you can use Ant to run the build.xml script directly
- Note that the SOM parameters are hard-coded (including data set).

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