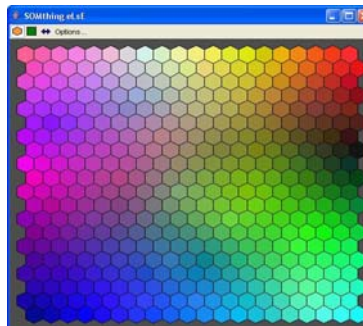
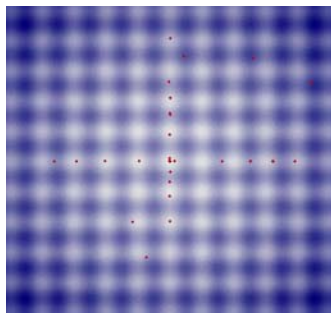


Interactive Inversion Software for Geoscience



Collaborators: Monash Cluster Computing

Objective

The aim of this project was to work with the Nimrod/O development team to develop a prototype interactive inversion front end to the Snark/Underworld (VPAC/Monash Cluster Computing) Geoscience finite element/particle-in-cell software package. This was achieved by implementing an evolutionary algorithm that works within the Nimrod/O framework and the creation of a self-organising maps generator/viewer to aid in visual analysis of the results.

Background

With the advent of the modern supercomputer, it has become possible to perform quite sophisticated geological forward modelling experiments. Frequently there is a need to work in the other direction, however. The sort of problems a geoscientist commonly deals with are to seek the set of material properties and initial conditions that lead to a modern day geological formation. This is a more complicated problem requiring successive trial and error methods. Since the forward modelling processes are quite computationally expensive, an efficient way of searching through the parameter space is required. This process of optimising the search for an answer is called inversion.

Outcomes

The Nimrod/O code was successfully extended with a genetic algorithm and a stand-alone self-organising maps generator/viewer, both of which are to be integrated into the Nimrod/OI web portal for use in interactive inversion. The self-organising maps package allows for generation and viewing of hexagonal and square SOMs with the option of including distance nodes.

As a continuation of the summer internship project, Nimrod/O is now being extended with a full interactive inversion module. It is also being tested for geological forward modelling problems with known optimal solutions, using Ellipsis and Snark. If the software performs well with these tests then it will be trialled on a 'real-world' problem, at which time we can start to address issues of efficiency and ease of use. This promises to be an exciting new development in both geological modelling and optimisation in general.