ECMM409 Nature-Inspired Computation

Assignment THREE: Evolving Nature-Inspired Solutions to Problems

Handout: 28th November 2008
Handin: 22nd January 2009
Back to you: 5th February 2009 (approx.)
Worth: 70% of the module

This is a **team** exercise and the report is an **individual** submission
You are reminded of the University's Regulations on Collaboration and Plagiarism, details of which are available on the School web page.

What you will do in this assignment is tackle a problem from a conference using a Nature-Inspired technique. The problems are part of an international competition to develop a Nature-Inspired algorithm to solve a given problem in accordance with the goals as stated for each problem. There are five problems to choose from which are available to download:

http://www.sigevo.org/gecco-2007/competitions.html
Competition 1: Evolving trading rules
Competition 2: Worst 1-MAX solver
Please note that Ant Wars is not available for selection in this CA

http://www.sigevo.org/gecco-2008/competitions.html
Competition 1: A 2D Packing Problem
Competition 2: Human Evaluation of Evolved L-System Images
Competition 3: Finding a Balanced Diet in Fractal World
Please note the Rubik's Cube problem is not available for selection in this CA

In your teams I want you to select **one** problem and write a Nature-Inspired algorithm to solve the problem and write up your experiments as if you were presenting them at the conference. You can test more than one algorithm if you wish (in fact this is encouraged) but you should only present one as the final 'best' algorithm.

HINT: To maximise your time, it is likely to be beneficial for you to separate the task into sub-problems that you can work on in parallel.

WHAT YOU HAVE TO DO AS A TEAM

- Select a competition from the above website and *carefully study the rules of the competition* which in some cases are quite restrictive. Make sure your implementation adheres to the requirements of the competition.
- **Develop an algorithm** or algorithms, in your choice of language (but bear in mind the deliverables for each competition, some of which include the provision of an executable) to solve the problem in the competition. Within the constraints of the competition, you should be as innovative as possible when doing this.
- **Perform experimentation** on the competition data/problem and make adjustments to the algorithm to improve performance. This might include the introduction of heuristics or modified operators to increase the performance of the algorithm (for instance, an adaptive mutation operator which varies the rate according to convergence).
- **Produce the deliverables for the problem** as stated on the competition page.

- Attend weekly meetings, which I will observe, to determine how you will tackle the problem and who will work on which aspect of the problem.
    o You will need to agree a meeting time with each other and me
    o You should keep minutes of these meetings.

WHAT YOU HAVE TO DO AS AN INDIVIDUAL
- **You will need to submit an individual report**. The individual report and any material for the competition can overlap in content, but please note that they will need to contain somewhat different information.

WHAT TO HAND IN AS A TEAM
1. The problem deliverables (as specified by the problem webpage).
2. Sets of minutes from each of the meetings.

WHAT TO HAND IN AS AN INDIVIDUAL
Hand in a report, of between 2000-3000 words. The report should include:

- **A description of how you contributed to the project (e.g. sections of code that you wrote, experiments you conducted, or other tasks you undertook).**

- **A discussion of the implementation process: e.g.**
    o What experiments were conducted by the team and why?
    o What conclusions were drawn from those experiments?
    o What changes to the algorithm were made to try to improve its performance?
    o Were the changes successful? If not, why not?

- **A discussion of the teamworking process: e.g.**
    o Did all members of the team contribute?
    o Did the team make use of all its available resources? If not, why not?
    o What were the most challenging and enjoyable aspects of working in a team?

- **A conclusion section discussing the success of the overall approach and teamworking process and briefly, any further approaches you consider might be appropriate.**

MARKING CRITERIA

Each individual's mark will be based on the following:

TEAM (from my observations and the team deliverables)
10% How well you worked as a team.
10% Algorithm selection and implementation
15% Overall success and quality of the team submission.

INDIVIDUAL (from individual report)
25% Individual contribution to the task.
20% Discussion of experiments and modifications made to the algorithm (e.g. were the modifications well chosen and backed up by experimental results?)
20% Quality of teamworking discussion and conclusions.

Finally, you may be asked to individually attend a 15-minute 'viva' to discuss your role in the project.

The teams are as follows:

Team "Asimo"
Jeremy Stephens
Mehmet Aktas
Haya Al-Askar

Team "Deep Blue"
Joe Townsend
Liam Battershell
Meng Zhang