FIT4012: Evolutionary Simulation and Synthesis
Programming Exercise 2

Name	**Questions**	**Due Date**	**Marks**
Exercise 2	5	6 September 2013	60

1 Exercises

1. Explain why Wilson's XCS algorithm is better at adapting to noisy environments than ZCS. In addition to your explanation, find a published example from the literature that demonstrates the effective use of XCS in noisy environments (include a brief description and a full citation). [4 marks]

2. Explain the difference between a Markov and Non-Markov environment in relation to LCS. Discuss some approaches to improving ZCS for Non-Markov environments. [4 marks]

3. Give arguments why mutation strength (e.g., p_m or σ) should be increased or decreased during the run of a GA or EA. [2 marks]

4. A simple multiobjective problem has two objective functions $f_1(\bar{x}) = x_1$ and $f_2(\bar{x}) = x_2^3$, and is subject to the constraints $x_1^2 + x_2^2 \leq 10$. What will the Pareto front for this problem look like? What evolutionary method would be best suited to solving this problem? [5 marks]

5. Develop and implement an evolutionary system that evolves some form of creative artefact. The form of artefact and the definition of 'creative' is up to you, but you will need to justify your use of both terms – probably through some formal verification and validation methods. Ideally, the system should run without human intervention, and should have a roughly linear relationship between time and quality of the artefact produced.

   A possible example: the artefact could be a two-dimensional image and 'creative' should mean humans find the images produced interesting. You support your claim that the system produces interesting images

by conducting some statistical tests on fellow students and reporting the results.

This question is rather open-ended, so please discuss your ideas with the lecturer *before* beginning to implement them. You should submit the code and associated documentation. Documentation should include:

- Sample artefacts produced by your system;
- Your interpretation of 'creative' and some justification for your claims;
- A brief overview of your approach and methodology;
- Summary of results;
- Any verification and validation performed on your system;
- Basic user and system documentation for your code.

[45 marks]

2 Submission

Your answers to the above questions should be placed in a single pdf file and emailed to the lecturer. You submission is due by 5pm on the due date (email: `Jon.McCormack @ monash.edu`). Your should also send an accessible link to the source code you have developed (in a tar file), or alternatively you can send the source code in a compressed tar or zip file attachment in your submission email. Code should run under any Unix-based operating system and should include a `Makefile` or script to build the program. Ideally, you should be able to change key parameters via the command line. Include any results of running your experiments (plots, stats, etc.) in the pdf document you submit.

Late submissions will attract a penalty as described in the unit guide for this unit. Results with feedback will be provided within two weeks of submission.