

THE UNIVERSITY *of York*

**MSc in Natural Computation  
MEng in Computer Systems and Software Engineering  
MMath**

**DEPARTMENT OF COMPUTER SCIENCE**

**EVOLUTIONARY COMPUTATION (EVCO)**

**Open Assessment**

**Issued: 30 October 2013**

**Submission due: 12.00 (noon) 8 January 2014.**

All students should submit their answers electronically to the Department of Computer Science by noon on **8th January 2014**. An assessment that has been handed in after this deadline will be marked initially as if it had been handed in on time, but the Board of Examiners will normally apply a lateness penalty.

Your attention is drawn to the Guidelines on Mutual Assistance and Collaboration in the Student's Handbook.

**Any queries on this assessment should be addressed to:**

**Dan Franks**

**Email: [Daniel.franks@york.ac.uk](mailto:Daniel.franks@york.ac.uk)**

**No queries received after 6 December 2013 will be answered.**

**You must obey the specified page limits for each question.**

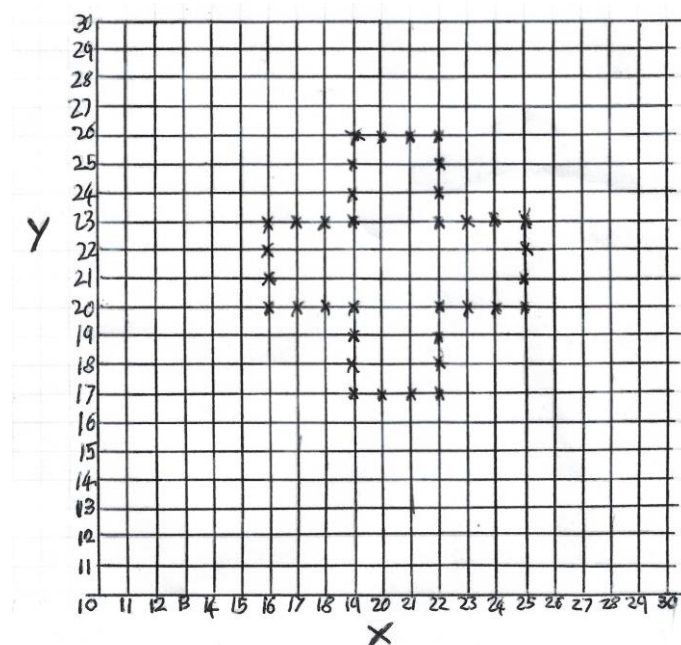
**Your examination number must be written on the front of your submission and each answer page. You must not identify yourself in any other way.**

## Evolving a 5T Morpion Solitaire Player

Morpion Solitaire is a one player game, played on a grid. An initial set of Xs are drawn in Greek Cross (see figure 1) on the grid. During each turn the player must add an X to the grid and draw a straight line that goes through the new X and is exactly five Xs long. A point is scored each time a line is drawn. The game ends when no more lines can be drawn on the grid. The version of Morpion Solitaire played here is known as 5T and the full set of rules and instructions can be found at: [www.morpionsolitaire.com/English/rules.htm](http://www.morpionsolitaire.com/English/rules.htm)

**You are required to design an evolutionary algorithm to create a player for this game. You should aim to create a player that maximizes its score.**

Figure 1 shows the grid (with the coordinate system) and the initial state of the game. Note that this is a snapshot. However, the  $x$  and  $y$  coordinates in our game are limited to between 0 and 40.



**You should then write a critical report detailing your approach, algorithm, decisions, analysis, and so forth. Include your player's best score as the first thing you report in your results section.**

You are free to use any available optimisation systems *provided due acknowledgment is given* (for software available over the web you should give a URL). You should include as an appendix any code that you have written in order to perform your investigation. You are expected to show a systematic approach to the above investigation and communicate your findings effectively and methodically. You should write an introduction, detail your solution space and representation, provide details of your algorithm including the effect of different parameter settings, show results in terms of speed and performance along with statistical comparisons and then present conclusions, interpretation, critical analysis, and discussion. You should provide all information you believe necessary and use appropriate references throughout.

**The main part of your report must not exceed 12 pages. This includes any tables and graphs, but excludes any front page, table of contents, references and any appendices. Marks will be given out of 100.**