Overview of the Lecture

- Coursework description.
- Firefly scheme.
- Implementation.
- Experiments.
- Report.
Coursework Description

Implement a cellular automata simulation of firefly synchronization.

Aim

The aim is to discover under what conditions (i.e. for what parameter values) synchronisation occurs.

Obs.: Determining what can be considered as a parameter of the system is part of the coursework.
Firefly Scheme

Similar to weekly exercise 2, the behaviour of one firefly is as follows:

What can be considered as a parameter of the fireflies system?
You may use any programming language you like.
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You can use a 2-d CA in which each state of a cell corresponds to a firefly’s state.
  - You can use a 2-d array to store the state of each cell.
  - Each cell position corresponds to the (fixed) position of a firefly.
You may use any programming language you like.

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  - You can use a 2-d array to store the state of each cell.
  - Each cell position corresponds to the (fixed) position of a firefly.

Use a loop to go through all the cells and work out what the next state should be:
  
  - If the cell is currently lit, its next state is zero.
  - If a neighbour is lit and the cell is charging, its next state is zero.
  - Otherwise, increment state.
You may use any programming language you like.

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- If the cell is currently lit, its next state is zero.
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- Otherwise, increment state.

You will need an auxiliary 2-d array to record the next state of each cell. Why?
You may use any programming language you like.

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Once all next states are determined, replace the current 2-d array by the one with the next states.
Experiments

- What do you want to test?
- What data you want to collect?
- How best to analyse the data?
Introduction to Natural Computation

Tutorial – How to Write the Report

Alberto Moraglio
Do you want a good mark?

• This is NOT a PROGRAMMING assignment

• You MUST include the code (mark ZERO if not), BUT the code itself is not going to be marked

• We MARK the REPORT
  – To get a good mark, you have to produce a GOOD REPORT
The Questions

1) A brief description of how you implemented the simulation
2) A description of the experiments you performed
3) The results obtained in your experiments
4) A summary of your findings
1) A brief description of how you implemented the simulation

• First say what you wanted to do and why
  – Your code will not be reverse-engineered to figure out your intentions!
  – Use figures to illustrate the Firefly scheme chosen
  – Report explicitly your design decisions

• Then report:
  – the high-level structure of the program
  – describe the function of the main modules of the program
  – DO NOT describe your code in details (include your code as an appendix to the report)
2) A description of the experiments you performed (experiments plan)

• Report the different combinations of parameter values used to determine when you get synchronisation
• Show your reasoning in the choice of the parameter values while still being explorative
• State your experimental questions explicitly:
  – what are you trying to answer by doing a certain experiment? (E.g., determine the effect of the grid size on the synchronisation)
3) The results obtained in your experiments (experimental results)

• Report the results of all planned experiments (use graphs/tables when appropriate to concisely report the results)

• For each experiment do multiple runs, as the experiments have a random component and can produce different outcomes, and report percentage of success

• Interpret the results:
  – To what extent the experiments answer your experimental questions?
  – What was surprising and what was expected?
  – Sensitivity: what happens when changing the values of some critical parameter?
  – Comparison: what different parameter settings lead to the same outcome?
4) A summary of your findings

• Repeat all important points very briefly:
  – What was the aim of the study?
  – What were the key design choices made?
  – What were the main experiments planned? To answer what questions?
  – What were the experimental results?
  – What did you find out you did not know before running the experiments?
Writing style matters!

• Type the report (no hand-writing)
• Use good academic English
• Proof-read your report
• Be clear, accurate, complete and concise
  – Less is more: get straight to the point
• Read the following guide before writing your report:
  http://www.cs.bham.ac.uk/~pxc/proj/ProjectReport.html
Write it while doing it (1)

• Think what you want to do (not how to do it) and why you want to do it, and write it down immediately (do not scribble it, use full sentences)

• Before coding, write down what your program is supposed to do (i.e., informal specifications)

• Heavily comment the program while coding, not later
Write it while doing it (2)

• Experiments are empirical answers to questions: 
  before running the experiments, write down explicitly what you want to answer
• Keep a detailed diary of your experiments
• Write down your fresh impressions right after each experiment (how is the experiment answering your question? Is it corroborating what you thought? Is it disproving it?)
• Pick all the above writing, put it together, and create a first draft of the report. This is MAGIC as the report is writing itself!
May the force be with you!