Coursework outline for COMP6216 – Simulation Modelling for Computer Science

The assessment consists of two components

Coursework Assignment I (worth 30%)

Give a 10 minute talk (+2 minutes questions) about a simulation modelling paper published in a peer reviewed journal (see slides from first lecture – http://users.ecs.soton.ac.uk/mb8/sim/Intro.pdf -- for a list of suggested papers). The talk should give

(a) a brief overview over the area of research the paper addresses,

(b) explain its contribution to the area, and

(c) give a brief overview over the type of simulation modelling being used.

Marks will be given on:

(i) if the delivery of the talk is according to a standard that it could be used in teaching/presented at a conference, (ii) your comprehension of the paper and how well you answer questions, (iii) if your slides meet professional standards, and (iv) the general organisation of the talk and how well you covered the aspects mentioned above.

Talks will be scheduled after Easter, so have your talk ready by April 18, it can be scheduled in any lecture/seminar slot after that date.

Coursework Assignment II (worth 70%)

A modelling problem is described in the first set of lecture slides (see material copied from the lecture slides below). You are to address this problem using modelling techniques using a differential equation based approach and agent based modelling, compare your findings from both approaches, and write a 6 page conference paper that summarises your findings. The 70% marks you can obtain for this part of the coursework are split as follows:

Quality of the writing and figures in the report	10%
Technical work: • Develop a model based on differential equations addressing the problem, i.e. give a differential equation that models the problem, describe how you derive it, and reason about its classification (7.5%).	40%

• Explore the use of analytical techniques to gain insight into the system's behaviour, i.e. analyse the above differential equation, find full (or equilibrium) solutions, and argue about their stability (7.5%). • Numerically integrate the differential equations using an appropriate integration method of your choice and compare the results to the analytical results, i.e. develop the computer code for an integration scheme (from scratch, do not use off the shelf libraries or integrated functions provided by math software) and give evidence that it reproduces system behaviour correctly, reason about parameter choices made in your integration scheme (10%). • Implement an agent-based model that addresses the same problem. Give evidence (e.g. appropriate example output) of the model you have implemented , and compare your findings to the results obtained with other methods (from above) (15%). • (Use both models to) answer the research questions given below	
Quality of an original extension of the problem: • marked according to originality (Is this an interesting question to ask in this context?), quality of the analysis (do you understand what is going on and did you use appropriate techniques to analyse the model?), and its motivation (can you convince me that it makes sense?).	20%
Total for CW assignment II	70%

Reports are due at the end of term (May 13). Don't forget to upload any simulation code you developed for the assessment.

Further instructions about the assessment can be found in the first set of lecture slides (copied into the document here):

Problem description from lecture slides

Consider the following situation:

● A population of students is working on group projects. Students can follow two strategies (S): work hard for the project (S=H) or free-ride (S=L).

● In every course, groups of size n are formed at random. Students use the strategy determined at the beginning of the course (i.e. S=H or S=L) in their group work.

● Total group effort is determined by the composition of the group. In a group with h hard workers and l=n-h lazy workers total group effort is e=h*H+l*L (H and L being the effort put in by hard/lazy workers).

● When group projects are marked, every student gets the same mark. The lecturer determines this mark as m=e/n (i.e. by dividing total group effort by the number of students in a group; the larger this number the better the mark)

● At the end of the semester every student rethinks his strategies for the next semester. He does this, by selecting another student at random and comparing a measure π based on marks and effort, π=m-a*S (where a is a parameter and S=H or S=L depending on strategy). The measure accounts for the mark obtained, but is lowered by the amount of effort spent. Very good marks without effort maximise the performance measure. If the student selected for comparison got a higher performance measure π, the reference student will imitate the reference student's strategy with a probability proportional to the difference in performance measures. In case the comparison student got a lower measure, the first student does not change his strategy.

● Students study forever (i.e. take an infinite number of courses) and follow the same procedure (as outlined above) for every course they take.

Research questions to address:

● Assuming we start with equal numbers of hard working students and lazy students, what is the composition of the group
  – After 4 years (i.e. 8 courses) if H=1 and L=0 and a=0.5.
  – In the long run (after an "infinite" number of years)?
  – How quickly is this equilibrium state reached?

● How do the following parameters influence results:
  – Initial composition of the population
  – Group size (n)
  – Cost of effort a
  – Contribution of hard workers to group effort (i.e. H and L)