

Performance Evaluation – Master UBINET

Assignment 2

Solutions have to be sent by Sunday February 19th 2012 to `giovanni.neglia@inria.fr`. Explain carefully your reasoning. The code has to be easily readable (and then well commented).

Ex. 1 — (Flu) Consider a population of N persons where a new variant of flu is expected to spread. The population can be considered homogeneous. Every pair of persons has on average 20 contacts per day that are long enough to enable the transmission of the virus. During one of such contacts between a susceptible person and an infected one, the probability that the first one gets actually infected is estimated to be $1/10$. On the average a person is expected to recover from the disease after one week, but she/he could get the flu multiple times.

1. Show that a Continuous Time Markov Chain model can be derived if pairwise contact processes are assumed to be iid Poisson processes and recovery times to be iid exponential random variables.
2. Derive a fluid model for such Markov model. Provide the values of the different parameters in the fluid model.

Ex. 2 — (Game Tournament) Determine Nash Equilibria and Pareto Optimal outcomes for the following games:

	S3	S4
S1	5,20	1,210
S2	100,12	2,14

	S3	S4
S1	0,0	75,25
S2	25,75	40,40

For each of them propose a strategy that you think would get a high payoff in a repeated game with discount factor $\delta = 1 - 10^{-4}$ (or equivalently a repeated game that can be terminated with probability 10^{-4} at each stage). The strategy can take into account the complete history of moves against the same opponent. Justify your choice.

Implement your strategy as a Matlab function changing the file *yourfirst-name.m* in the corresponding folder. The function has the following inputs:

rc denotes your role: Rose (if $rc=1$) or Colin (if $rc=2$).

h1 is a vector with the history of all your previous choices (in chronological order) against the same opponent, both as Rose and as Colin. Rose's strategies are 1 and 2, Colin strategies are 3 and 4.

h2 is a vector with the history of all the choices (in chronological order) of your opponent against you.

Your function has to produce an output coherent with your role (then 1 or 2 if you are Rose, 3 or 4 if you are Colin). In order to test your function you can execute the file `assignment2game{1,2}arena.m`. If you want to test your strategy against other possibilities you can also change the files corresponding to your colleagues. There are `nc` instances of each of your strategies and at each stage the script randomly matches the instances that play the game against each other. The number of rounds is a random variable, geometrically distributed with parameter $p = 10^{-4}$.