TEK5010 Multiagent systems

Lecture 6: Task allocation and self-assembly

Exercise: Deriving response threshold models

Question 1

In this exercise we are going to derive different response threshold models.

An agent is exposed to a stimuli signal over a time interval. The probability of the agent responding to the stimuli (over the time interval) is given by the variable ρ. The response would be to do a particular task associated with the stimuli signal or ignore the stimuli signal and not do the task.

a) What is the probability (observed over one time interval) of agent doing the task, $P_{task,1}$? What is the corresponding probability of agent not doing the task, $P_{not\ task,1}$?

b) What is the probability of not doing the task if we sample two consecutive time intervals (which are assumed to be statistically independent)? What is the corresponding probability of the agent doing the task when observed over 2 intervals?

c) Why is $P_{task,2} \neq P_{task,1}^2$ observed over 2 time intervals?

d) What is the probability of not doing the task over 3 intervals? And, what is the probability of doing the task over 3 intervals?

e) What does $P_{task,N}$ and $P_{not\ task,N}$ look like for *N* intervals? Hint, use the binominal expansion.

f) Could you reformulate $P_{task,N}$ into an exponential form?

g) Plot $P_{task,N}$ as a function of *N* (or *s*) for the 3 different models given in the lecture up to *N*=1000 using $\rho = 0.01$.
Hint, remember these graphs, they might come in handy when solving the obligs.