PSM Fall 2018, Exercise Sheet 1

Problem 1. In insect societies the ratio of female vs. male individuals varies dramatically between species. A myrmecologist[1] wants to determine the f/m ratio for the ant species *Cataglyphis bicolor* (one of the most intensely studied ants – being one of the most heat-tolerant multicellular animals known and also being able of stunning navigation feats https://en.wikipedia.org/wiki/Sahara_Desert_ant). Your task: Describe in plain but precise English a suitable RSOI and its OO's; think of RVs that the myrmecologist will want to use; and formal specify the DVS for each of your RVs. *Note*: there are several natural ways to specify a RSOI for this scientific situation.

Problem 2. Another exercise in setting up a RSOI and its components. – You know that the "random" number generating function `rand`, which comes with every programming language (including MS Word!) in one form or the other, is actually not really generating *random* numbers, but only *pseudorandom* numbers which look and feel like being drawn from the uniform distribution on [0 1], but which in fact are computed by a deterministic algorithm. Many such pseudorandom generating algorithms are known, and they differ with regards to aspects like speed, breakability (if they are used in encryption applications), and importantly, they differ with respect to how close they come to true randomness. Put yourself into the role of a software engineer who is about to program some simulation toolbox for some end-customer, and this toolbox must contain a high-quality `rand` function. You have the choice between ten different pseudorandom number generating algorithms A_1, …, A_{10} that you have found in the math literature. You want to do some practical test-checking for finding out how these algorithms compare to each other. Your task: specify an appropriate RSOI-OO-OP-OA-DVS scenario. I don't give you further hints here – you are on your own.

[1] Myrmecology: the science of ants