Towards an Evolutionary model of Sexual Selection and Fidelity Dynamics in Multi-Agent Populations

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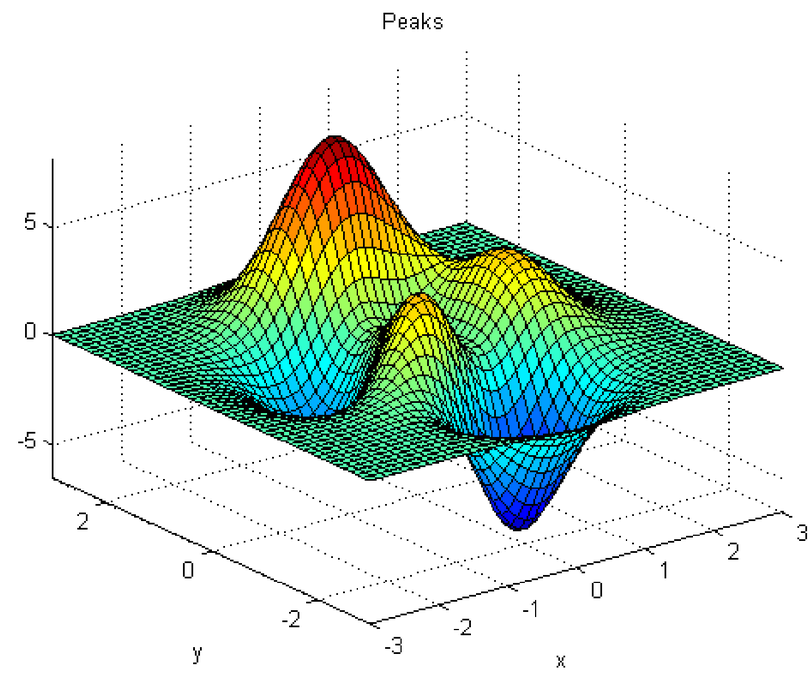
Motivation

- Evolutionary computation models have been used extensively and sucecessfully to approach optimization problems
- Comparatively, they have had limited use in studies about evolutionary dynamics
- Besides from the evolutionary biology motivations for studying evolutionary dynamics, a better comprehension of them can advance the handling of the pragmatical purposes of evolutionary computation (i.e. Optimization problems)
- Our purpose is to argue that the genetic algorithm model can be extended to investigate hypothesis in theoretical evolutionary biology

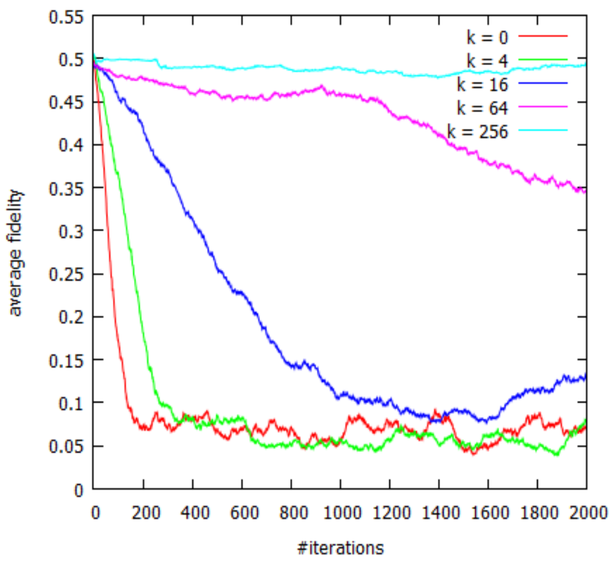


Methodology

- Our model consists of an extension of the classical *genetic algorithm* model, meant to include sexual selection dynamics in addition to the natural selection dynamics present in the original model.
- Core idea: in addition to other traits, agents' genotypes codify a sexual selection function (a bijection from the space of agents to $\mathbb{R}$ in which each agent is assigned an actractiveness measure). This function acts as an objective function at the agent - not population - level.
- As a case study, we investigate fidelity dynamics in a sexually dimorphic population in which male agents have their genotypes determining their faithfulness to their mates and female agents have their genotypes determining their sexual preference for males. Additionally, young agents must receive nurture from their parents to achieve sexual maturity.

Results

- We ran a series of experiments variating the amount of nurture k needed by an agent to achieve sexual maturity
- We found that the environment will generally select agents with low fidelity
- The choice of the amount of nurture affects the speed of this process: the smaller the amount of nurture k, the fastest the average fidelity of the population will decrease



Conclusions

- Although relying on a simple model, we were able to study varied aspects of evolutionary dynamics
- We can argue that genetic algorithms can be sucessfully used in investigations about theoretical biology
- Besides from validating our model, we got some interesting results about evolutionary dynamics in itself

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