

Invaders on Daisyworld: A Computer Simulation of Invasive Species

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Keywords: TODO

ABSTRACT GOES HERE TODO

1 Introduction

A healthy ecosystem exhibits homeostatic properties[1] that maintain an environment hospitable to the native species, allowing for a stable system in situations where life may not normally exist. External pressures such as climate change may cause an ecosystem to collapse given there is a large enough change that the system cannot react in time[2]. If the change is not large enough so that the system can adapt, the additional stress of the introduction of a non-native species can cause the adaptation to fail and the collapse of the ecosystem's homeostasis[3].

To explore the extent of which an ecosystem can adapt to a changing environment, a computer simulation of DaisyWorld[4] was developed. This model is *Agent based*[5], where the ecosystem is simulated by aggregation of many simple autonomous agents that perform simple

tasks. By being made up of these agents the system can exhibit complex behaviour through their interactions.

In the original specification of Daisyworld, there are only two kinds of daisies, black and white. These two daisies flourish at the same temperature, only differing by the amount of incident radiation that they absorb. It is this difference that causes the system to maintain homeostasis, too warm and more white daisies grow, causing the system to cool and vice-versa. The proposed change would be a new type of daisy that is identical to the “black” variation, besides growing in a warmer than normal climate.

TODO: describe what happens?

TODO: structure of the document

2 Method

TODO: Describe agents - What they contain - What they know about their environment - Spawning? - Maths from daisyworld paper - Update flow

TODO: Describe system - physical representation - temperature diffusion - Update flow - Omit the nitty-gritty details, keep things abstract

3 Results

TODO: Describe collection of results - Make sure that amount of runs is shown under each diagram - Show amount - consider plotting amount of runs vs temp - binary search for grabbing data?

4 Analysis & Discussion

5 Future work

TODO: Actually write about future work - Show the amount

6 Conclusion

TODO: How to conclude?

References

- [1] Ernest, S. and Brown, J. (2001). Homeostasis and Compensation: The Role of Species and Resources in Ecosystem Stability. *Ecology*, 82(8), p.2118.
- [2] Barry, G. (2014). Terrestrial ecosystem loss and biosphere collapse. *Management of Env Quality*, 25(5), pp.542-563.
- [3] Rapport, D., Regier, H. and Hutchinson, T. (1985). Ecosystem Behavior Under Stress. *The American Naturalist*, 125(5), p.617.
- [4] Watson, A. J. and J. E. Lovelock, 1983: Biological homeostasis of the global environment: the parable of daisyworld. *Tellus*, **35B**, 284–289.
- [5] Gilbert, G. (n.d.). Agent-based models.