

Instructions for Lab 2

Modelling of Systems for Sustainability

3rd October 2024

1 Introduction

1.1 Aim

This Lab session builds on what you learnt in Lab 1 to create a more realistic agent-based model (ABM). It is based on Chapter 4 of [Railsback and Grimm \(2019\)](#).

1.2 Overview

You should work through all the instructions listed below. In most cases, this will be in reference to Chapter 4 of [Railsback and Grimm \(2019\)](#). While the labs are not assessed, they are an integral part of the learning experience and will help you in getting the most out of this course. The labs are intended to be executed on DICE computers within the School of Informatics.

1.3 Prerequisites

Make sure you have finished Lab 1 (including the **Next Steps** in §3.4), as this will allow you to make the most of this lab session.

2 Instructions for Lab 2

2.1 Familiarisation

Before you start, read through Section 4.2 of [Railsback and Grimm \(2019\)](#) (starting on pg 49). Also, download the ODD specification for the butterfly program from the [resources page for the book](#).

2.2 Setting up the Butterfly Model

Follow Section 4.3 of [Railsback and Grimm \(2019\)](#). Remember to save your work regularly.

2.3 Next Steps

Read through Section 4.4 of [Railsback and Grimm \(2019\)](#). Then, if you have time, try the following exercises:

1. What effect does q have? Try values 0, 0.2, 0.6, 0.8, and 1.0 and see what happens.
2. Using the original value for $q=0.4$ try starting all turtles from the same location (you can pick some random locations yourself or use NetLogo to generate this randomly but the same for all turtles). What do you notice?
3. Now try starting the turtles closer to one hill than the others (e.g. 70 70), and again, try varying the value of q . What proportion of turtles (roughly) end up on each hill? can you explain why this is (Hint: think about probabilities).
4. Try out Exercises 3 and 4 from Section 4.6 of [Railsback and Grimm \(2019\)](#).
5. [This code](#) shows one way of dealing with the artificiality mentioned in Exercise 3 of Section 4.6. Take a look at it and see if you can work out what it's doing.

Useful Links

Book <https://read.kortext.com/reader/pdf/653121/Cover>
Book Resources <https://www.railsback-grimm-abm-book.com/downloads-errata-2nd-edition/>
NetLogo <https://ccl.northwestern.edu/netlogo/>

References

Railsback, S. F. and Grimm, V. (2019). *Agent-Based and Individual-Based Modeling: A Practical Introduction*. Princeton University Press, New Jersey, US, 2nd edition.