

APPENDIX B

Bugs Problem Description

*. We wish to simulate the evolution of “bugs” in a simple two-dimensional world. It is important to maintain a balanced and stable population in this eco-world. The world contains bacteria and bugs that eat the bacteria. The bacteria appear at random and persist at fixed locations until they are eaten. The bacteria in this world do not spread, age, or reproduce. Each bug has a variable position and orientation within the world; the bug population moves around the world randomly under the control of motion genes. Time is divided into uniform time steps in this two-dimensional world; during each step, each bug rotates randomly to a new orientation, then moves one unit forward in its new direction. Rotation is controlled by the motion gene. The world is divided into uniform cells with a finite number of angles such as a hexagonal grid with six possible angles. A bug eats any bacteria it finds within its cell, gaining a fixed amount of weight for each meal; however, at each time step the bug loses a fixed amount of weight to maintain its metabolism. If its weight becomes zero, the bug starves. If its weight exceeds a certain value, then the bug reproduces by splitting itself into two identical bugs each with half the original weight.

*This problem description is available in [74]

