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**SIMULATION CODE FOR**

**INFORMATION NICHE and COMPUTATION NICHE MODEL RESULTS**

**PURPOSE**

The code and data contained in this repository are supplied as supporting material for the submitted PhD thesis titled, “Pathways to Autopoiesis”.

All simulations were written in MATLAB r2016b.

**INSTRUCTIONS**

The following tables provide information on the MATLAB file to execute to reproduce the results described in Chapters 4 – 9.

Each of the files listed simply needs to be run from the MATLAB environment. All dependent functions and data sets are provided in the same folder, so ensure that you have added the folder path to your MATLAB environment.

**Chapter 4 – One State Information Niches (reproduced publication)**

|  |  |  |
| --- | --- | --- |
| **Figure** | **Filename** | **Description** |
| 3a | nicheA\_fig3a.m | 1-state well-mixed population, no influx |
| 3b | nicheB\_fig3b.m | 1-state zero-diffusivity population, no influx |
| 3c | nicheC\_fig3c.m | 1-state well-mixed population, phi=0.25 |
| 3d | nicheD\_fig3d.m | 1-state zero-diffusivity population, phi=1 |
| 3e | nicheE\_fig3e.m | 1-state zero-diffusivity population, phi=0.08 |
| 3f | nicheF\_fig3f.m | 1-state well-mixed population, phi’=0.25 |
| 6a | nicheAperturbed\_fig6a.m | nicheA -> nicheB -> niche X |
| 6b | nicheCperturbed\_fig6b.m | niche C -> niche B -> niche C |
| 6c | nicheBperturbed\_fig6c.m | niche B -> niche X -> niche B |
| 6d | nicheFperturbed\_fig6d.m | niche F -> niche Y -> niche F |

**Chapter 5 – Two-State Information Niches**

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| --- | --- | --- |
| **Figure** | **Filename** | **Description** |
| 5.1 |  | 2-state well-mixed population, no influx |
| 5.6 |  | 2-state zero-diffusivity population, no influx |
| 5.7 |  | 2-state well-mixed population, influx at 0.7 < phi < 0.9 |
| 5.8 |  | 2-state well-mixed, influx at phi > 0.9 |

**Chapter 6 – Spatial Patterns**

|  |  |  |
| --- | --- | --- |
| **Figure** | **Filename** | **Description** |
| 6.1 |  | 1-state zero-diffusivity lattice |
| 6.3/6.4 |  | 2-state zero-diffusivity lattice |

**Chapter 7 – Interacting Niches**

|  |  |  |
| --- | --- | --- |
| **Figure** | **Filename** | **Description** |
| 7.3 | fig7\_3.m | Joint one-state/two-state population, well-mixed, no influx |
| 7.4 | fig7\_4.m | Joint one-state/two-state population, zero diffusivity, no influx |
| 7.6 | fig7\_6.m | Niche 1A and niche 2B uniformly distributed at t=1 |
| 7.7 | fig7\_7.m | Niche 1A and niche 2B distributed at t=1 as per their original niche configurations |
| 7.8 | fig7\_8.m | Replacement of niche 1A automata with niche 2B automata at phi=0.05 |
| 7.9a | fig7\_9a.m | Joint one-state/two-state population, well-mixed, phi=0.05 |
| 7.9b | fig7\_9b.m | Joint one-state/two-state population, well-mixed, phi=0.5 |
| 7.9c | fig7\_9c.m | Joint one-state/two-state population, well-mixed, phi=0.8 |
| 7.9d | fig7\_9d.m | Joint one-state/two-state population, well-mixed, phi=0.95 |
| 7.10a | fig7\_10a.m | Joint one-state/two-state population, well-mixed, phi=0.85 to 2e6, phi=0 from 2e6 to 5e6 |
| 7.10b | fig7\_10b.m | Joint one-state/two-state population, well-mixed, phi=0.95 to 2e6, phi=0 from 2e6 to 5e6 |
| 7.10c | fig7\_10c.m | Joint one-state/two-state population, well-mixed, phi=0.85 to 2e6, phi=0 from 2e6 to 3.5e6, phi=0.65 from 3.5e6 to 5e6 |
| 7.10d | fig7\_10d.m | Joint one-state/two-state population, well-mixed, phi=0.95 to 2e6, phi=0 from 2e6 to 3.5e6, phi=0.65 from 3.5e6 to 5e6 |

**Chapter 8 – Computation Niche**

|  |  |  |
| --- | --- | --- |
| **Figure** | **Filename** | **Description** |
| 8.3a |  |  |
| 8.3b |  |  |
| 8.3c |  |  |
| 8.3d |  |  |
| 8.10a |  |  |
| 8.10b |  |  |
| 8.10c |  |  |
| 8.10d |  |  |

**Chapter 9 – Novelty in a Multi-State Computation Niche**

|  |  |  |
| --- | --- | --- |
| **Figure** | **Filename** | **Description** |
| 9.2 |  | Seed population only over 200 generations |
| 9.3 |  | Novel and seed population over 50 generations |