Spatial Simulation: Exploring Pattern and Process A Work in progress

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School of Environment
University of Auckland
Te Whare Wānanga o Tāmaki Makaurau
New Zealand

University of Tokyo
9 May 2012

1. **Origins**
   - Why another book about spatial models?
2. **Chapter Outline**
3. **Example models**
   - . . . and lots of them. . .
4. **In Conclusion**
   - . . . still lots to do. . .

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- Three big ideas prompted us to write this book
  - A crazy idea that there are many models but that they are built from only a few simple building blocks
  - Students (the ones we teach) find it hard to get started
  - The primary literature on simple models is challenging (maths, physics)

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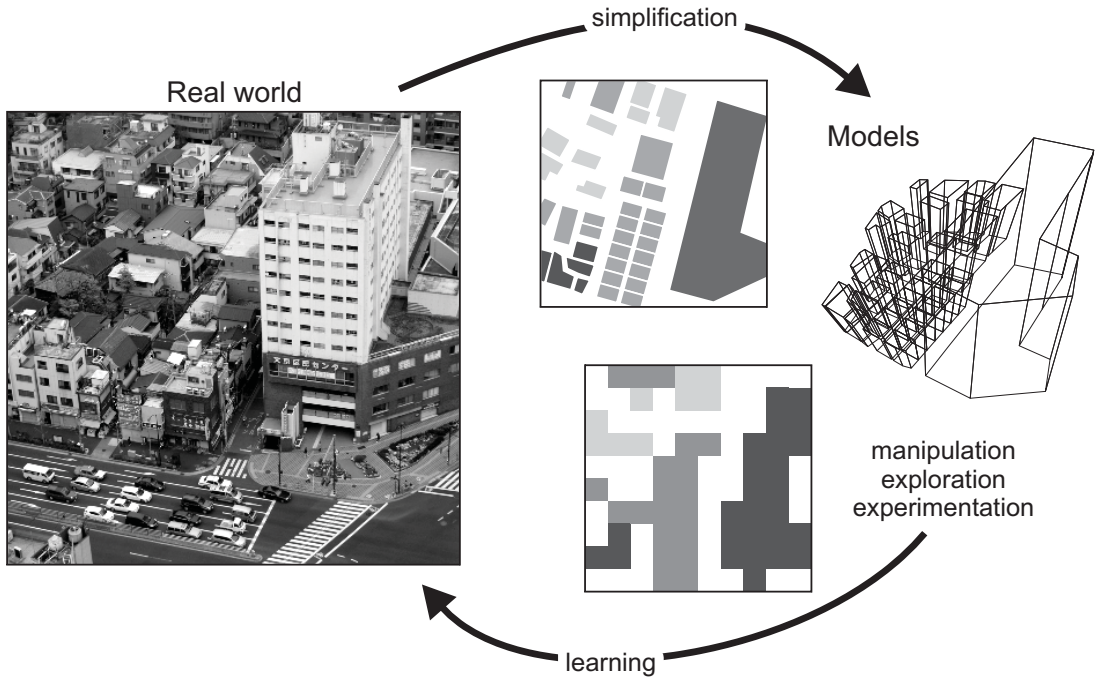
Chapter 1

Spatial Simulation: What, How, Why?

- What Are Simulation Models?
- How Do We Use Simulation Models?
- Why Do We Use Simulation Models?
- Why Dynamic and Spatial Models?



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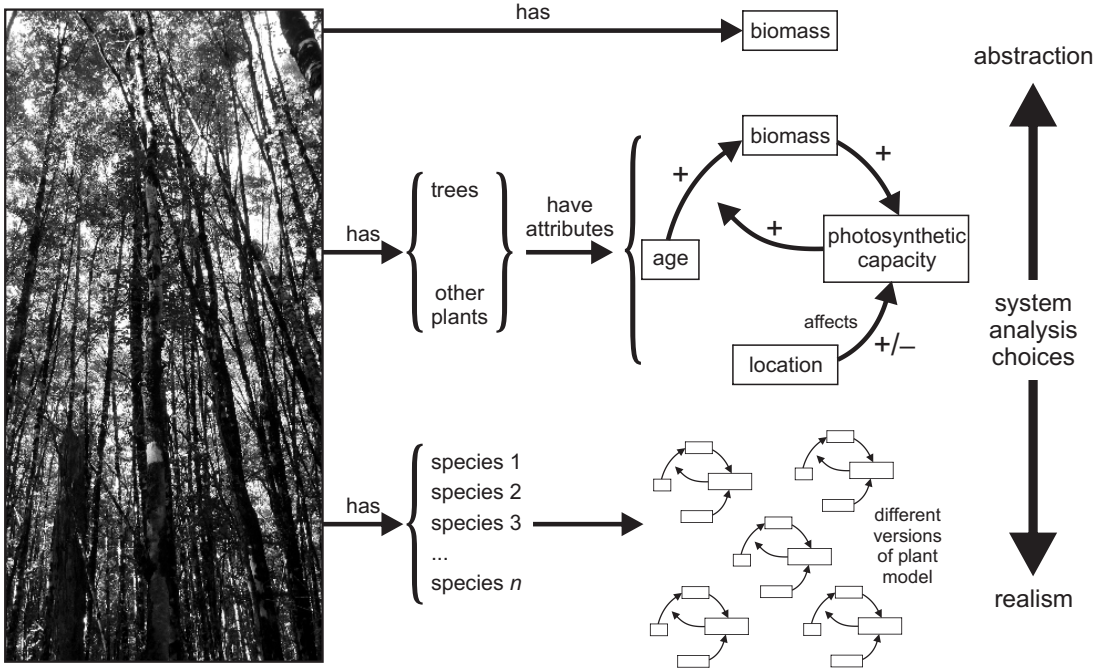

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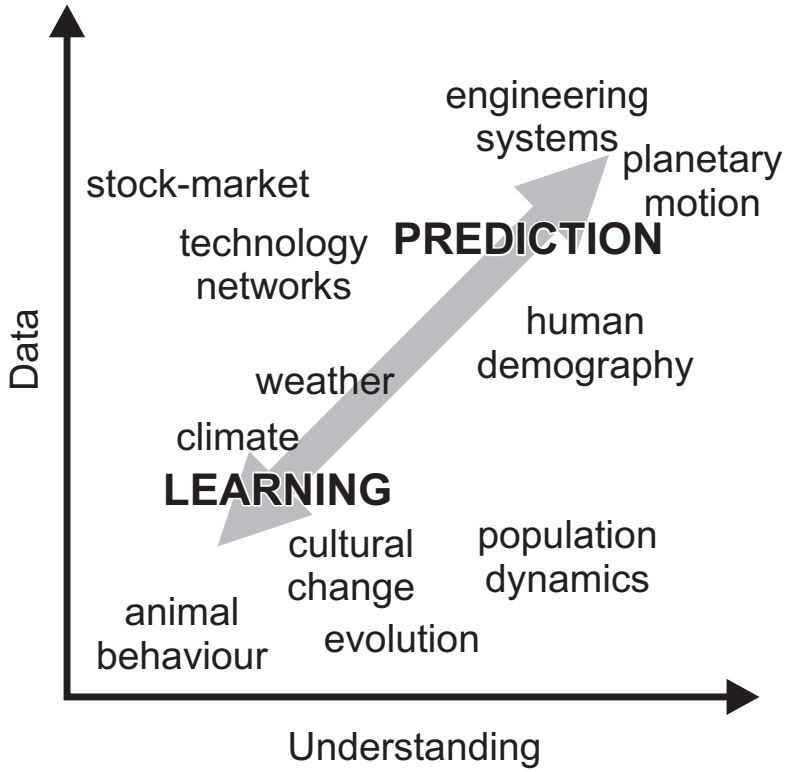

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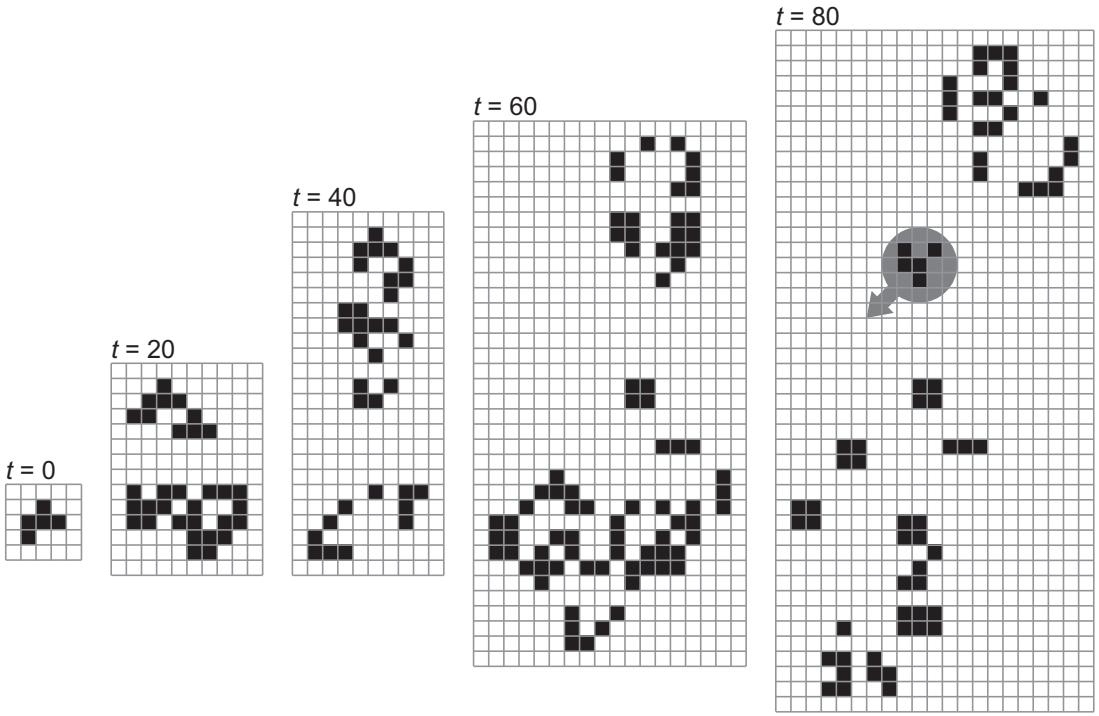

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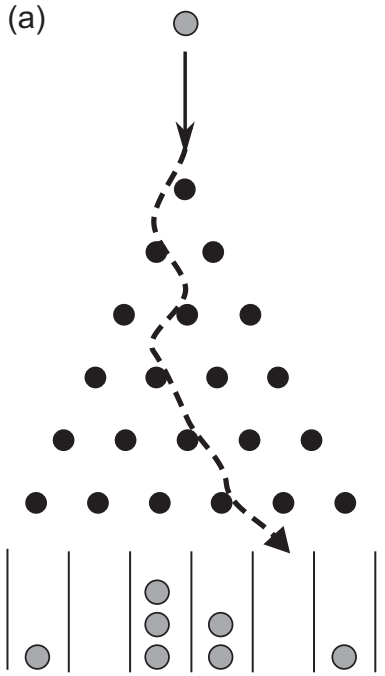
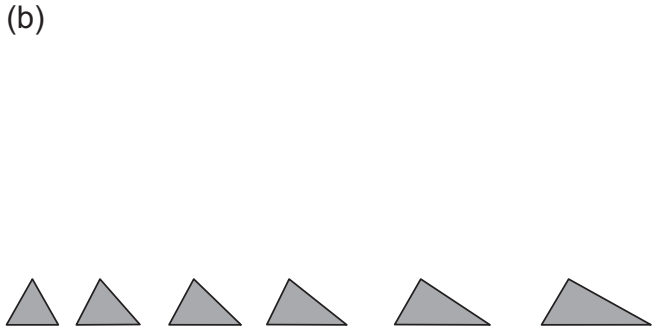


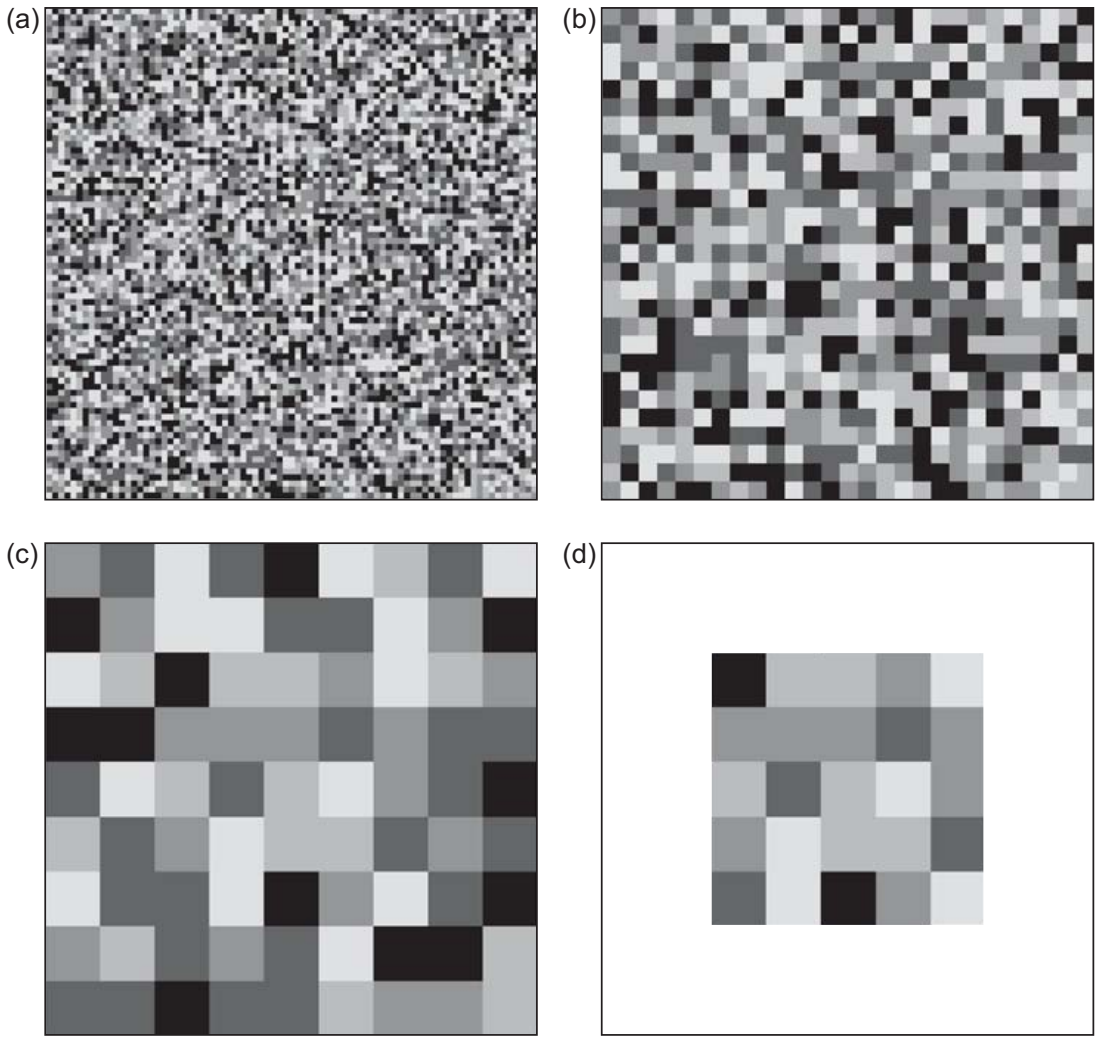


One row of a multiplicative Galton board showing distortion in triangles (left to right) in this case $c \sim 0.8$

Chapter 2

Pattern, Process and Scale

- Thinking About Spatio-temporal Patterns and Processes
- Using Models to Explore Spatial Patterns and Processes



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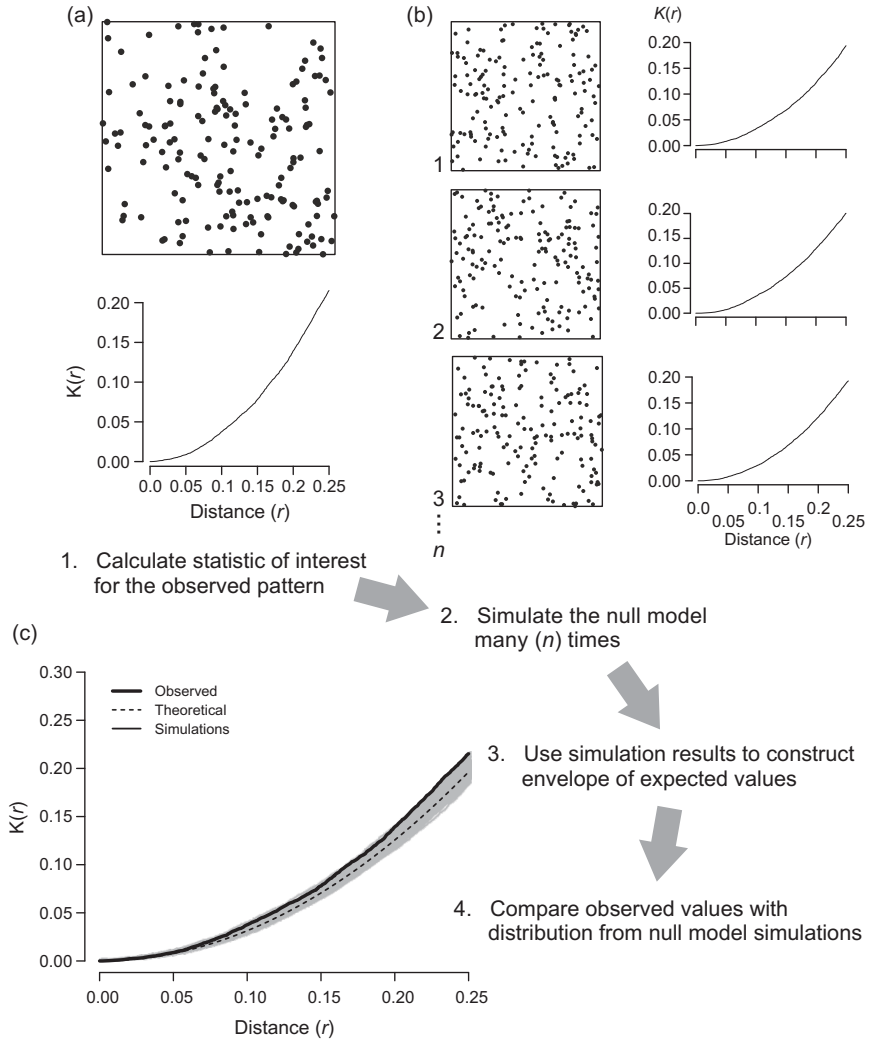

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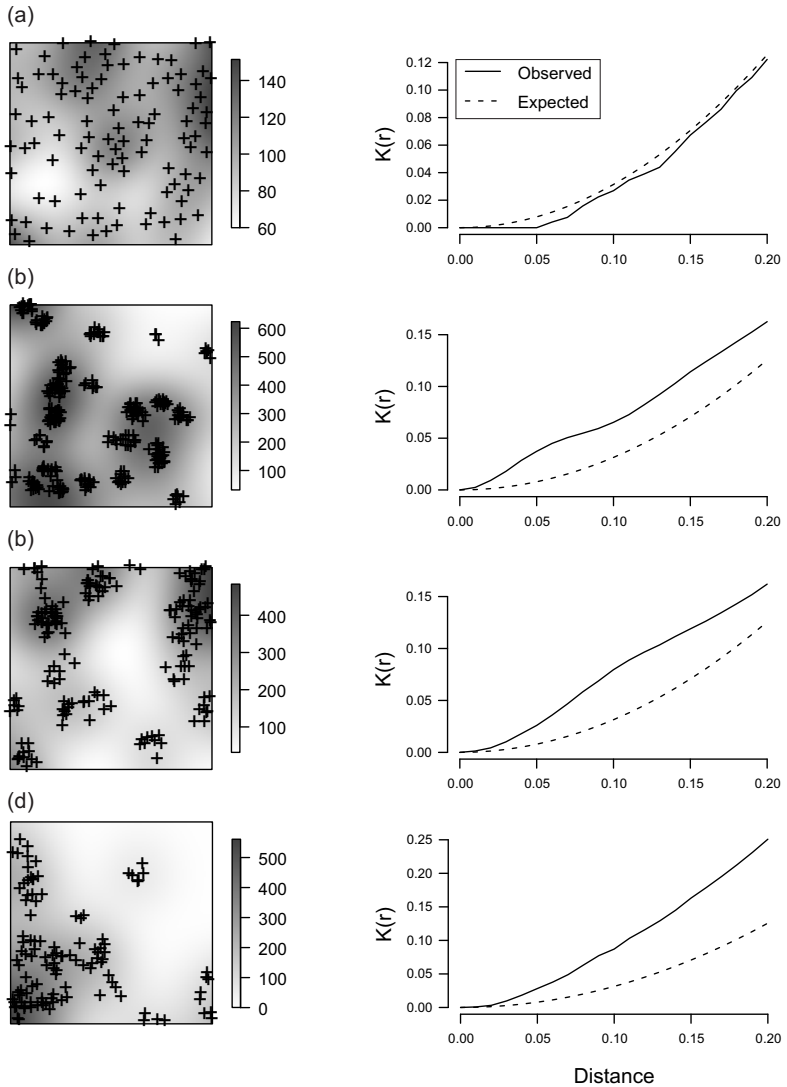

Chapter 3

Aggregation and Segregation

- Motivating Examples
- Models
- Extensions

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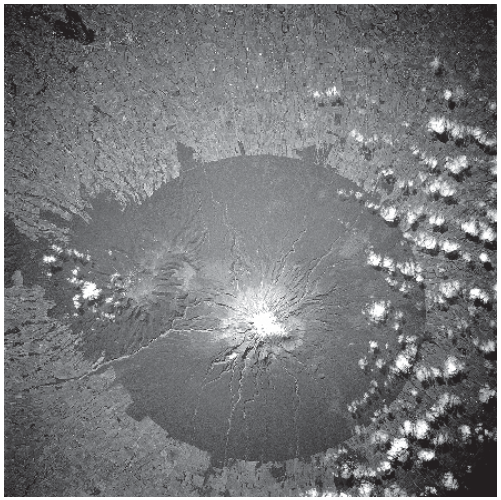

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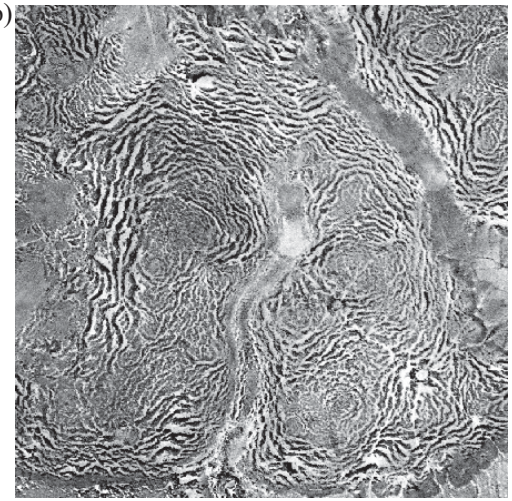

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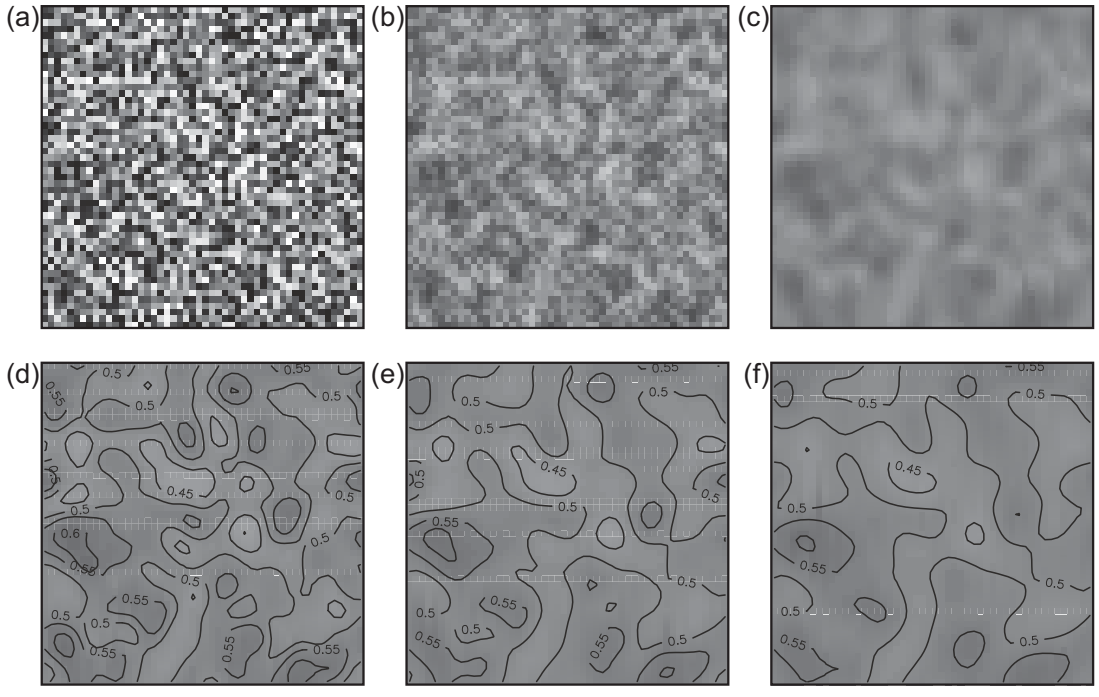

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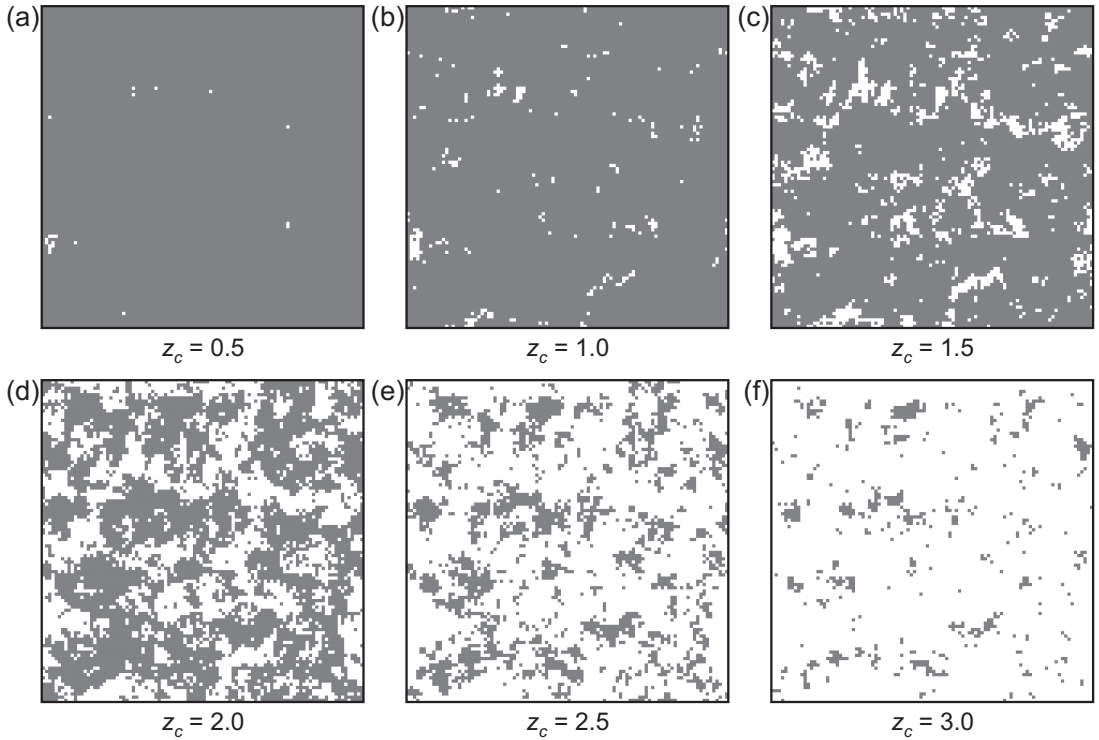

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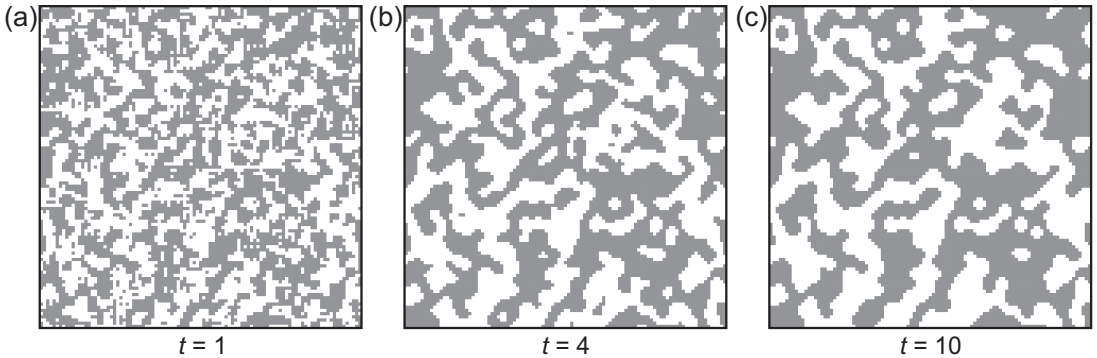

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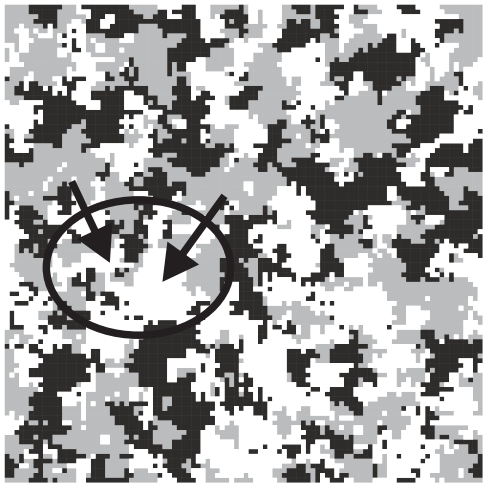

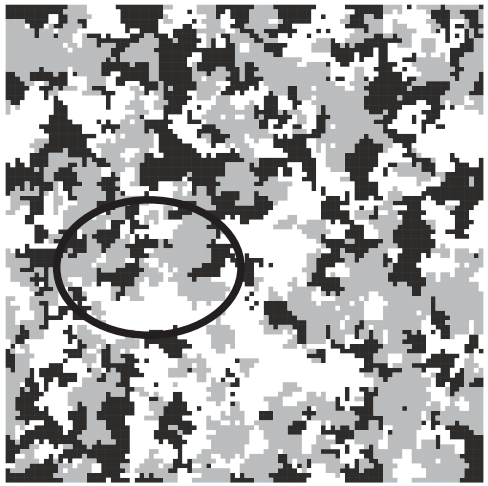

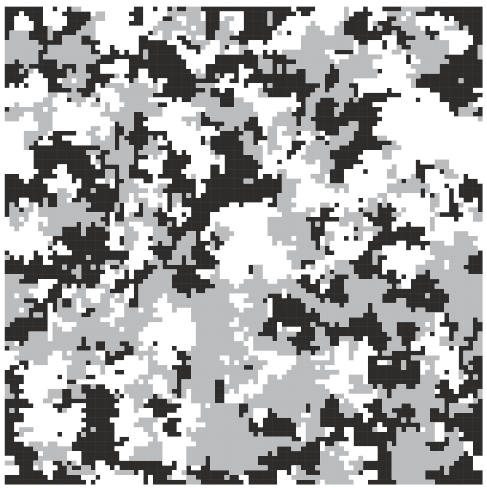

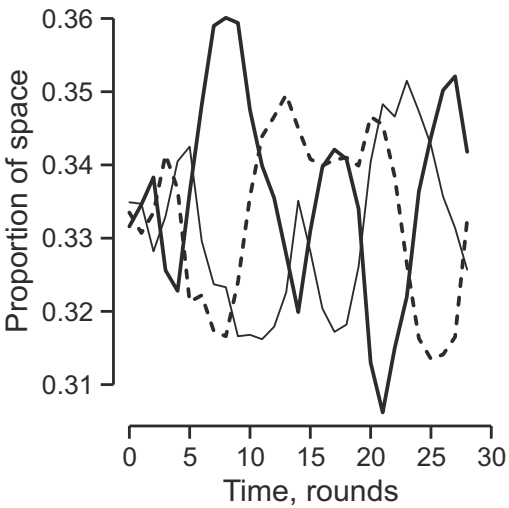

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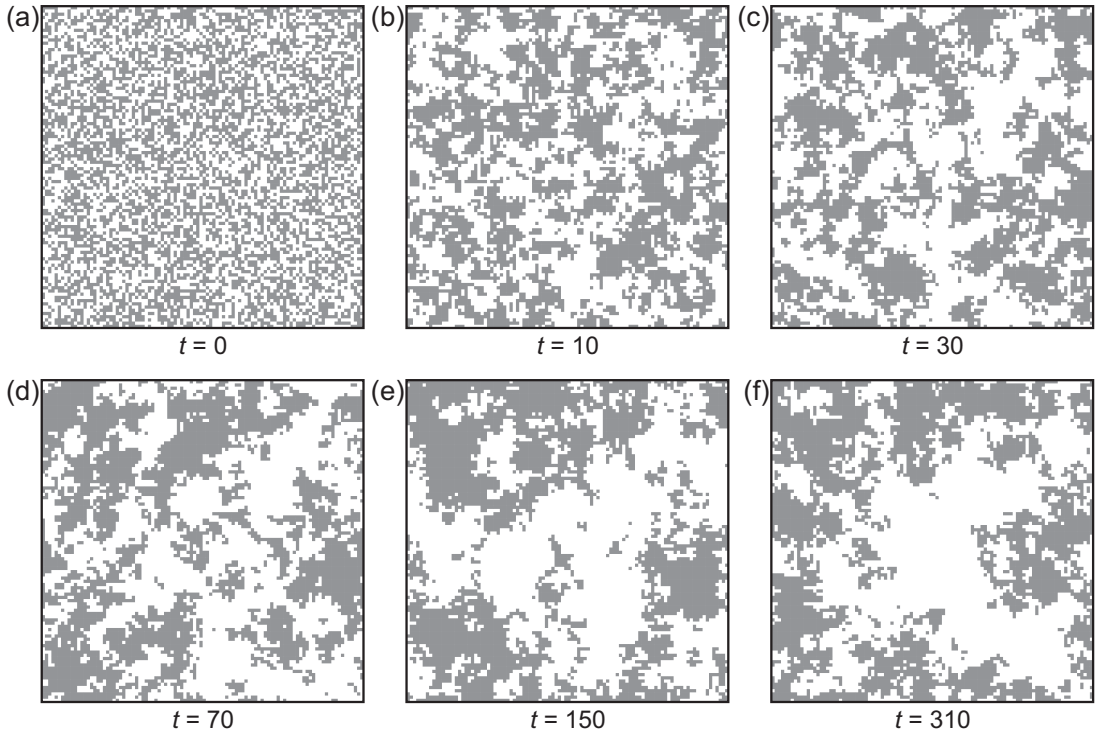

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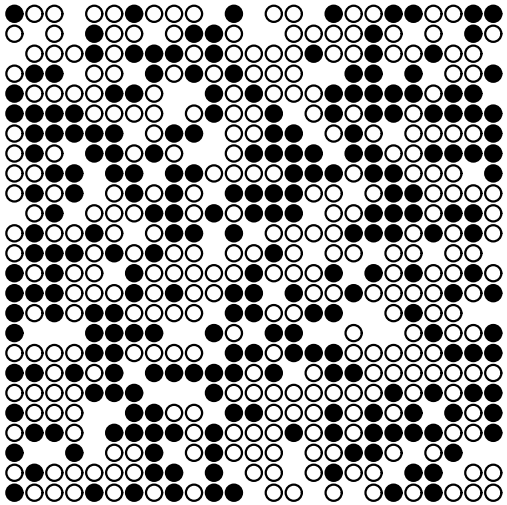

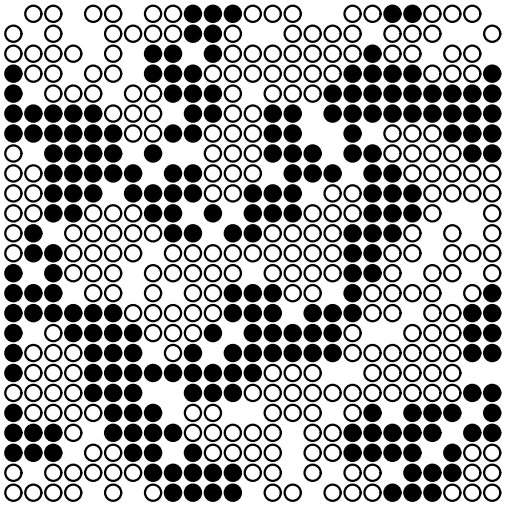

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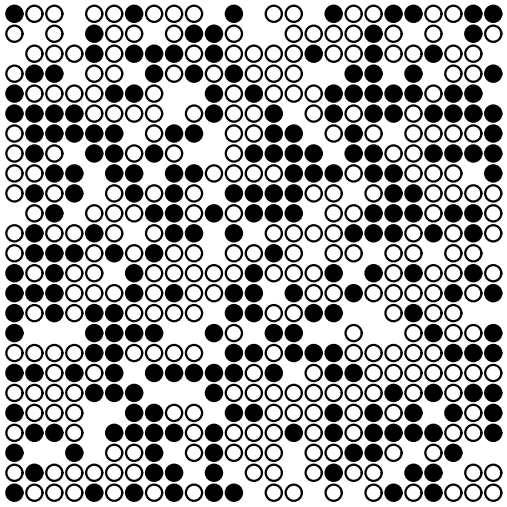

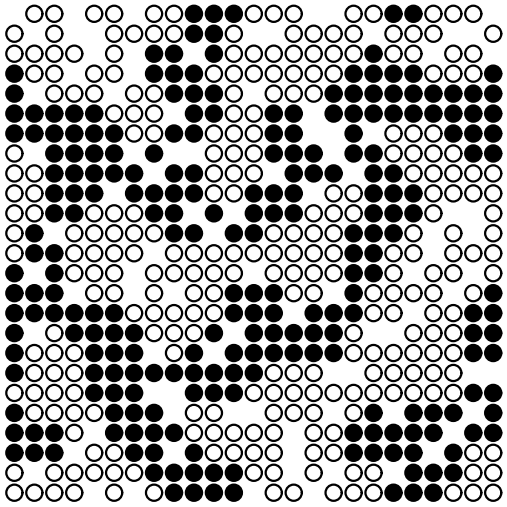

Chapter 4

Random Walks and Mobile Entities

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(b)

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other
photo here

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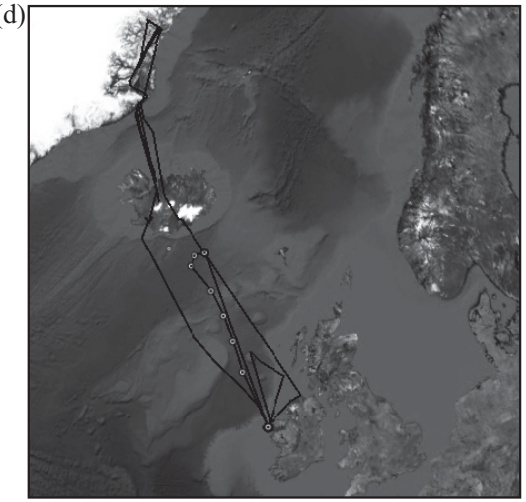

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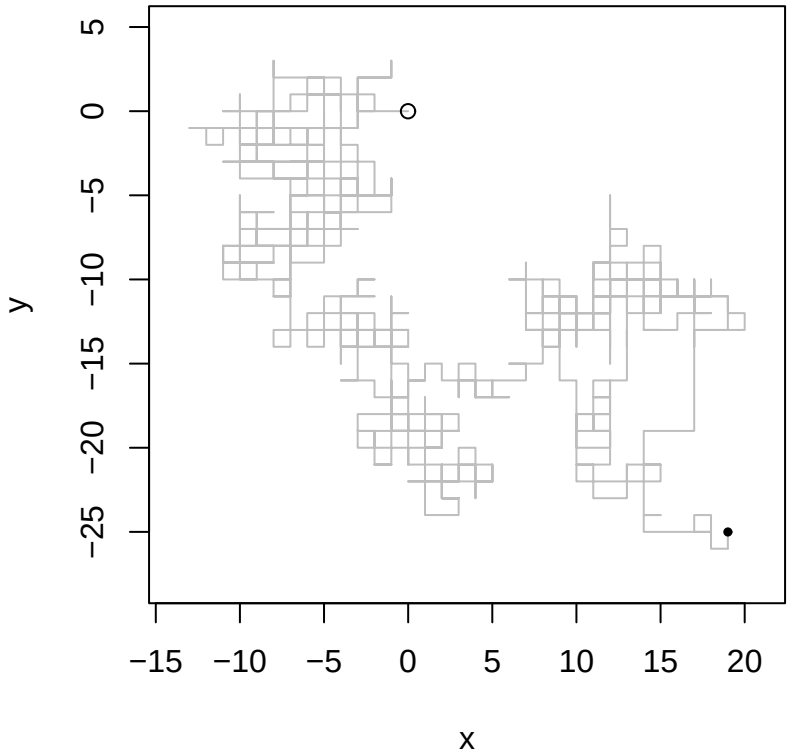

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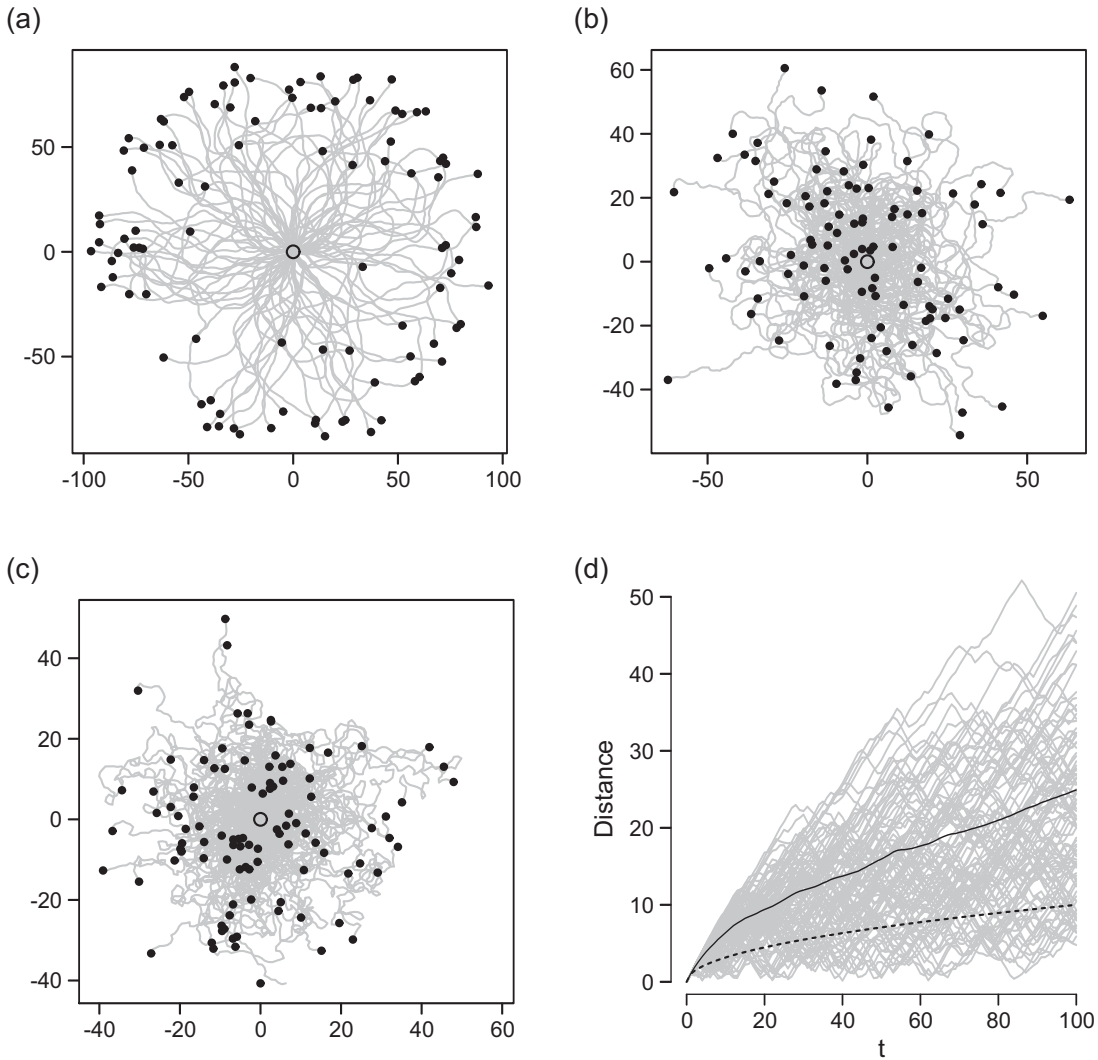

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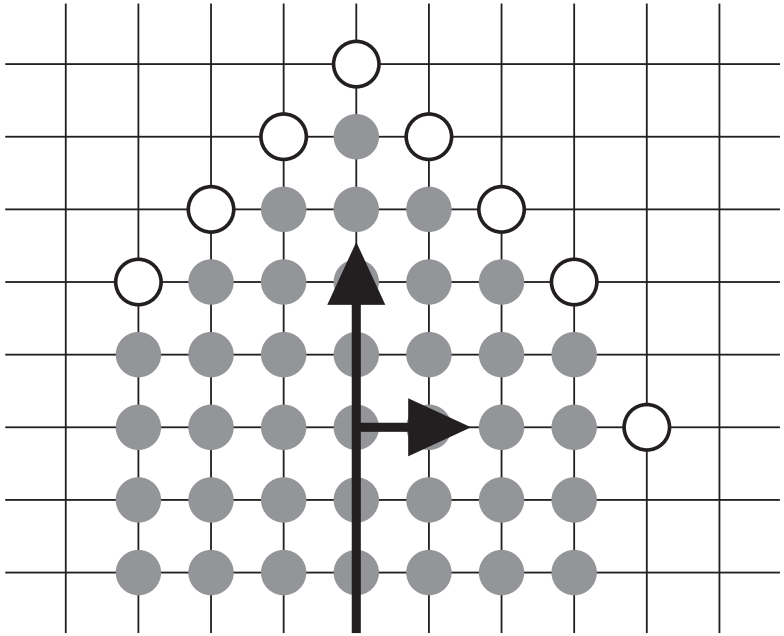

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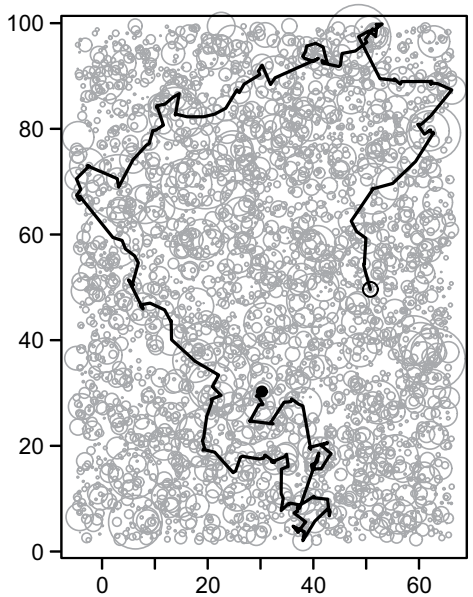

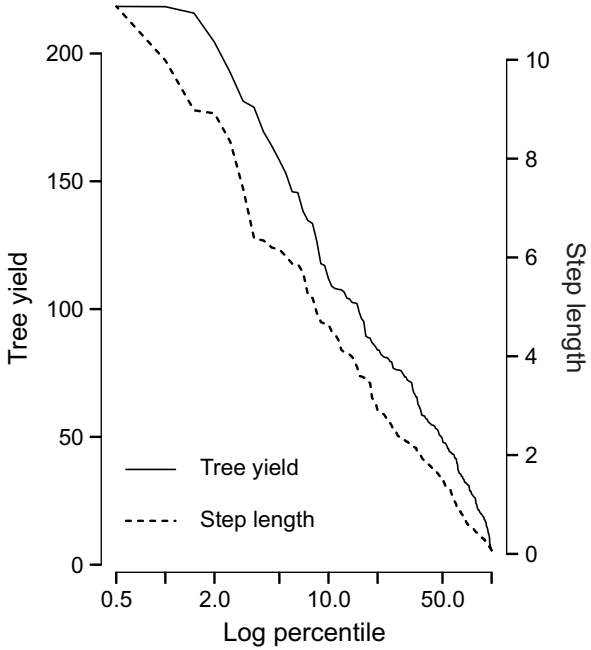

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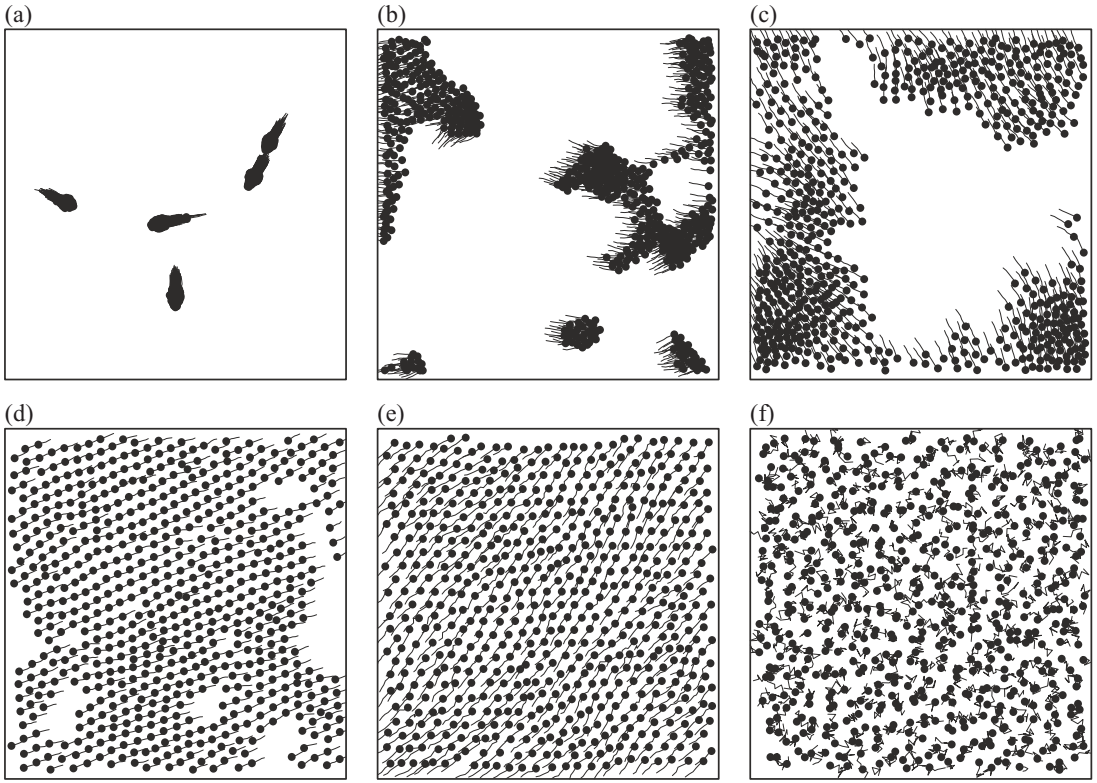

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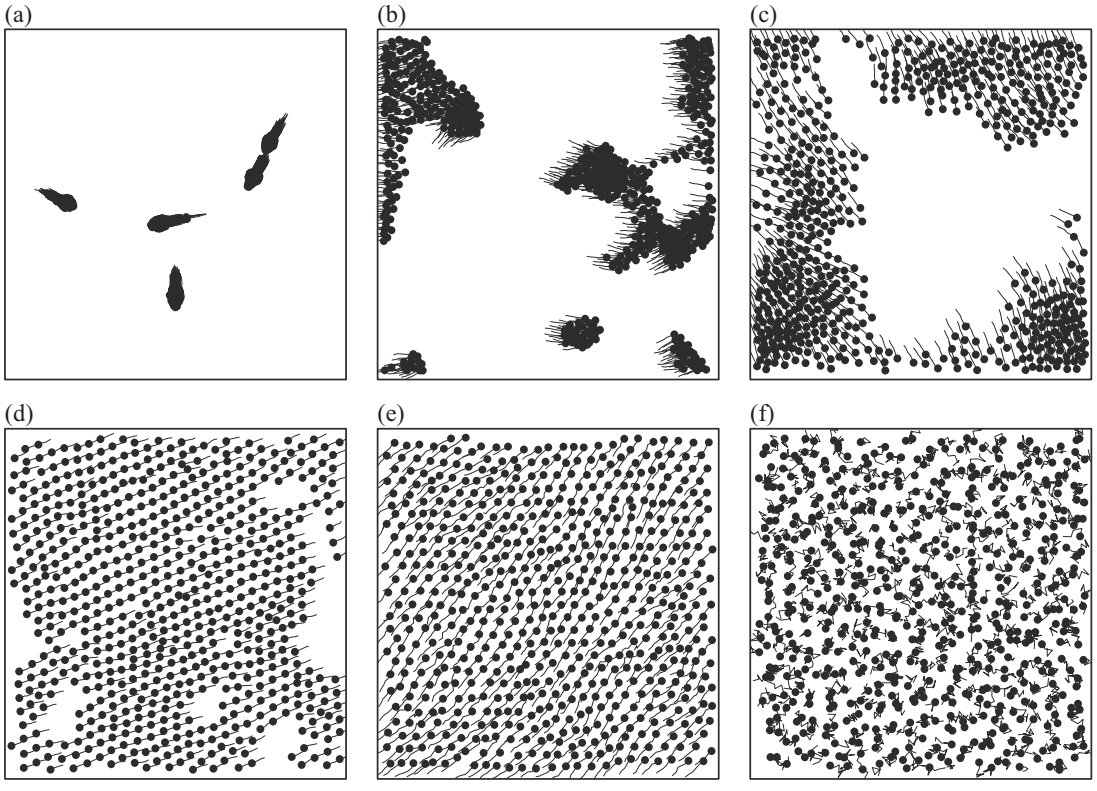

Chapter 5

Percolation and Growth: Dispersal and Spread

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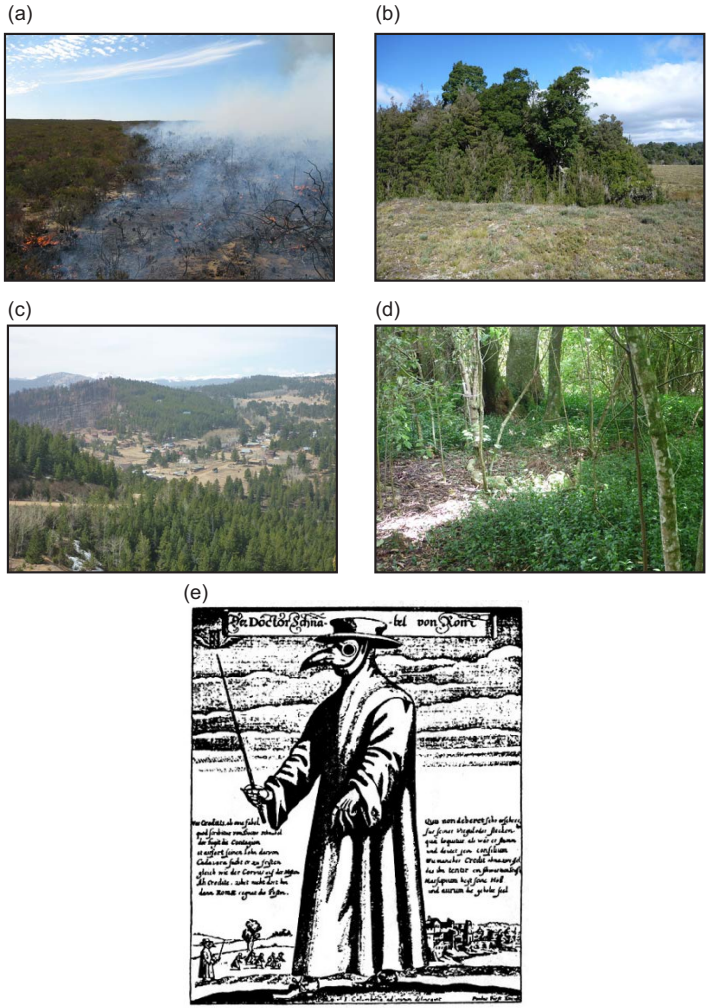

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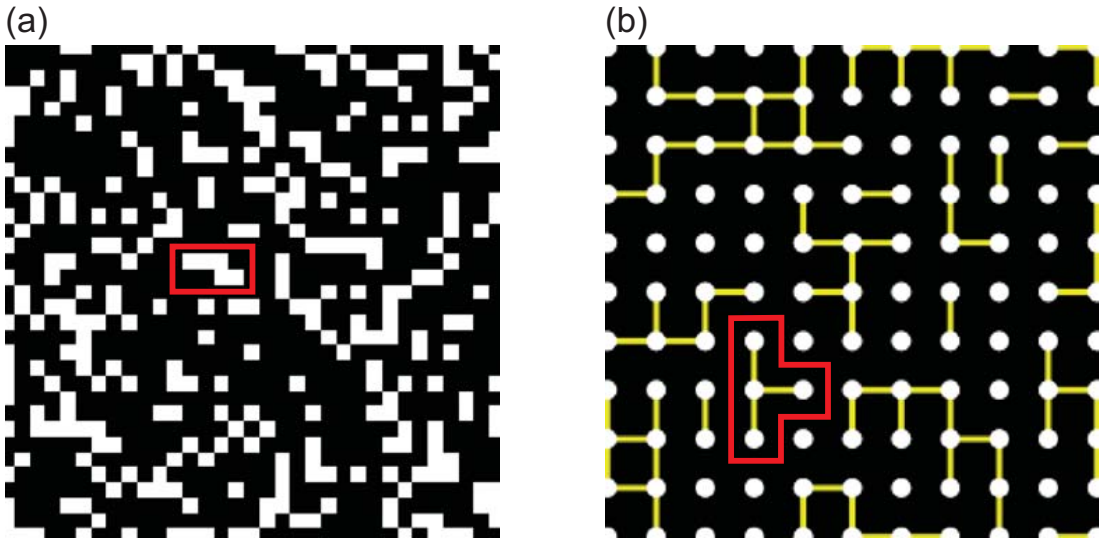

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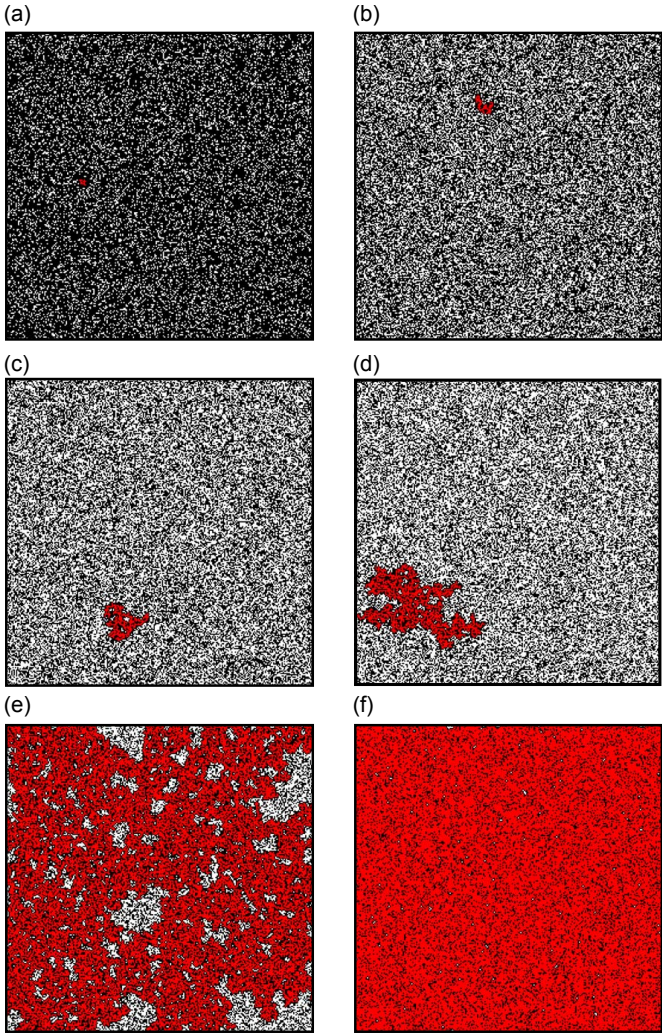

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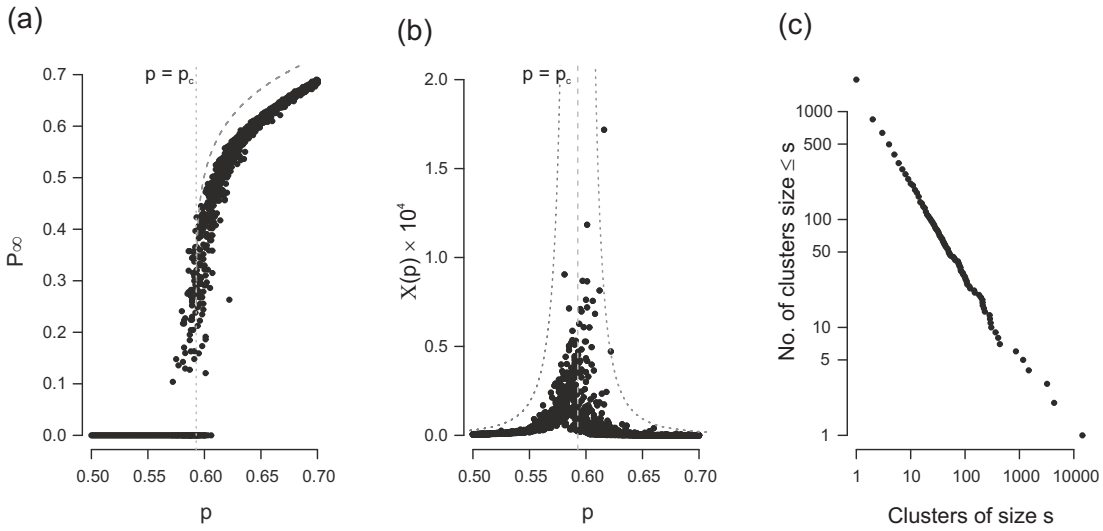

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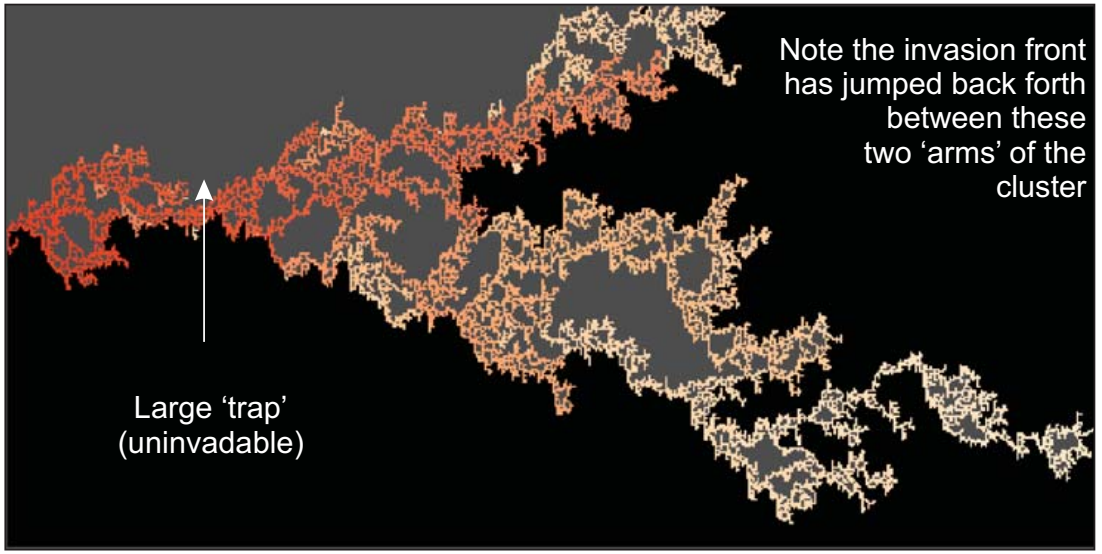

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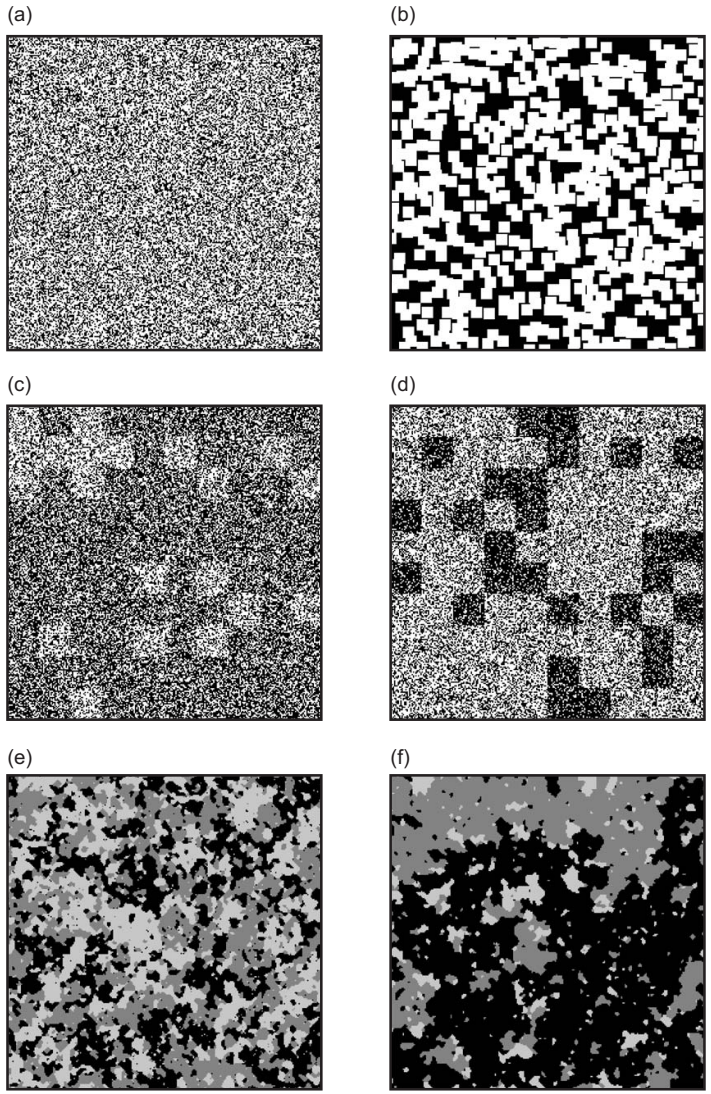

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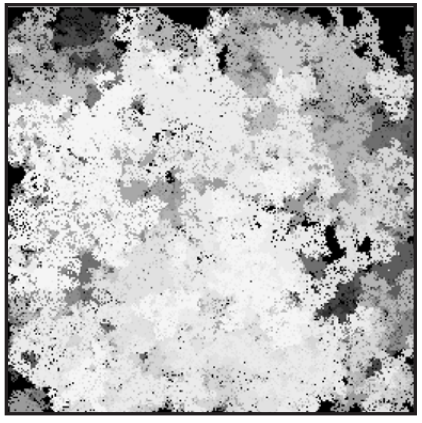

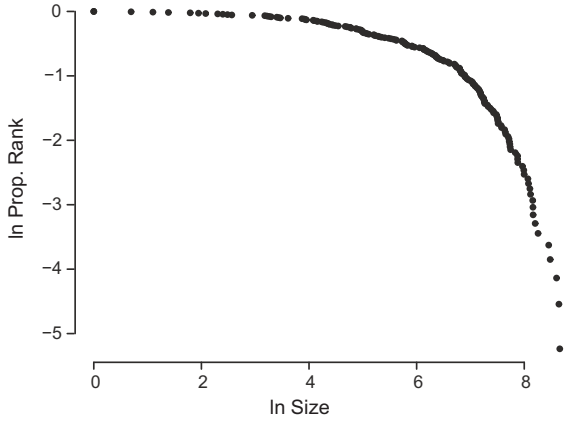

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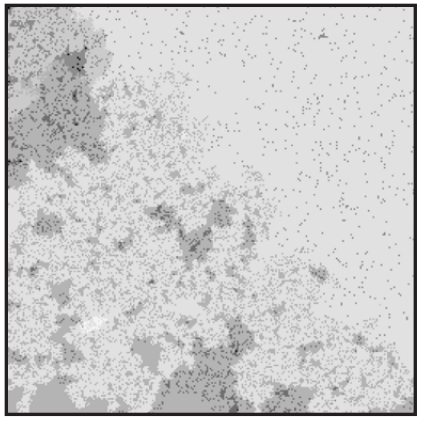

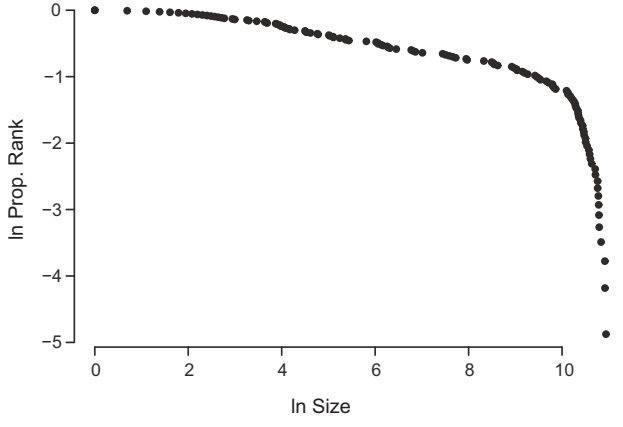

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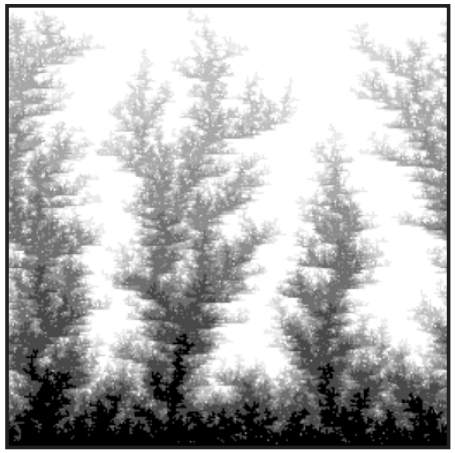

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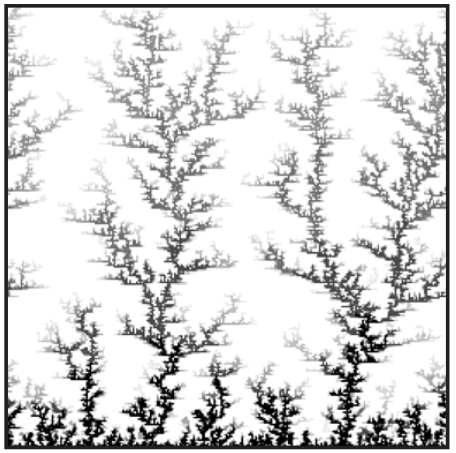

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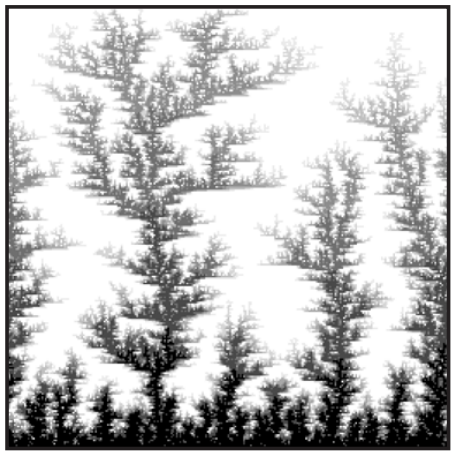
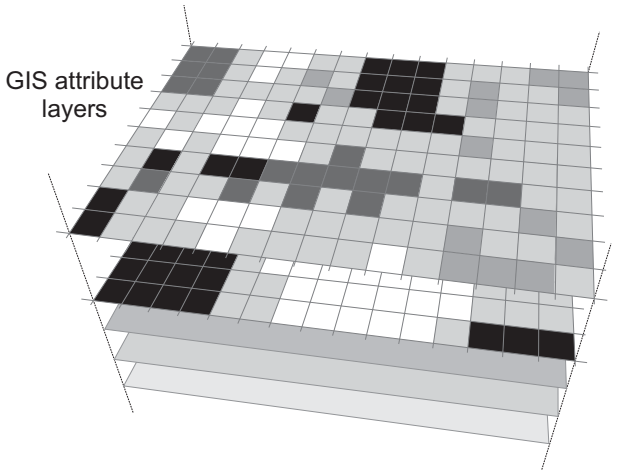
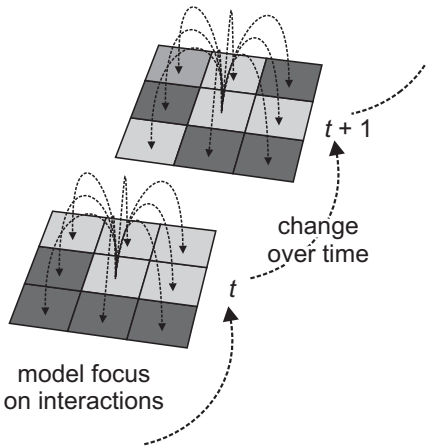


Chapter 6

Representing space and time

- Representing Space
- Representing Time
- Types of Spatially Explicit Model
- Spatial and Temporal Representation Matter!





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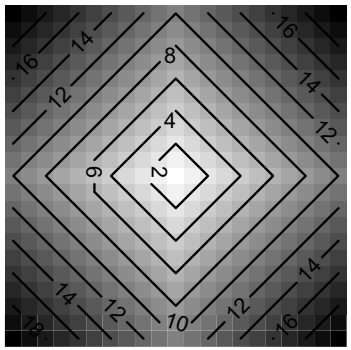

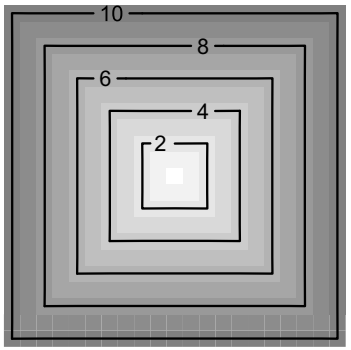

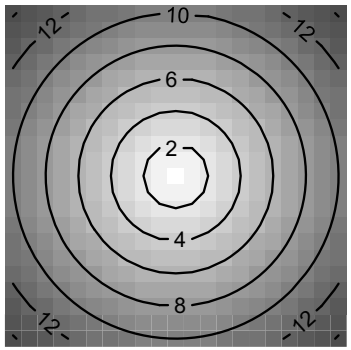

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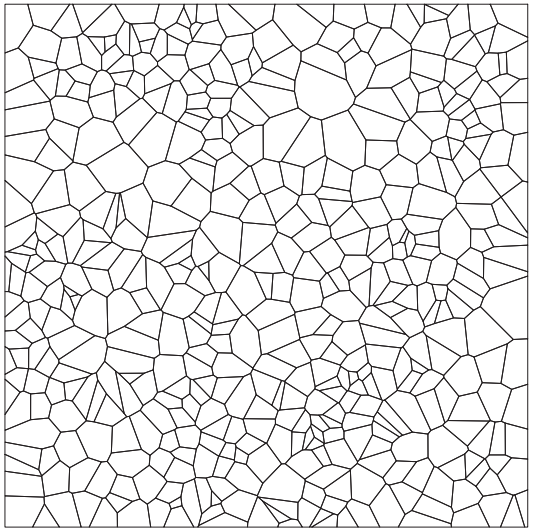
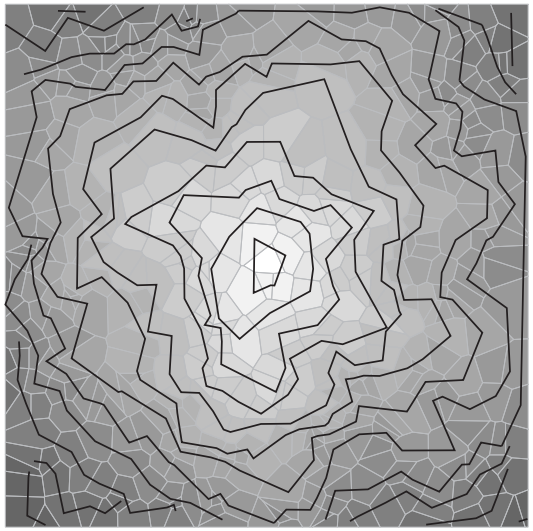
- Spatial and Temporal Representation Matter!





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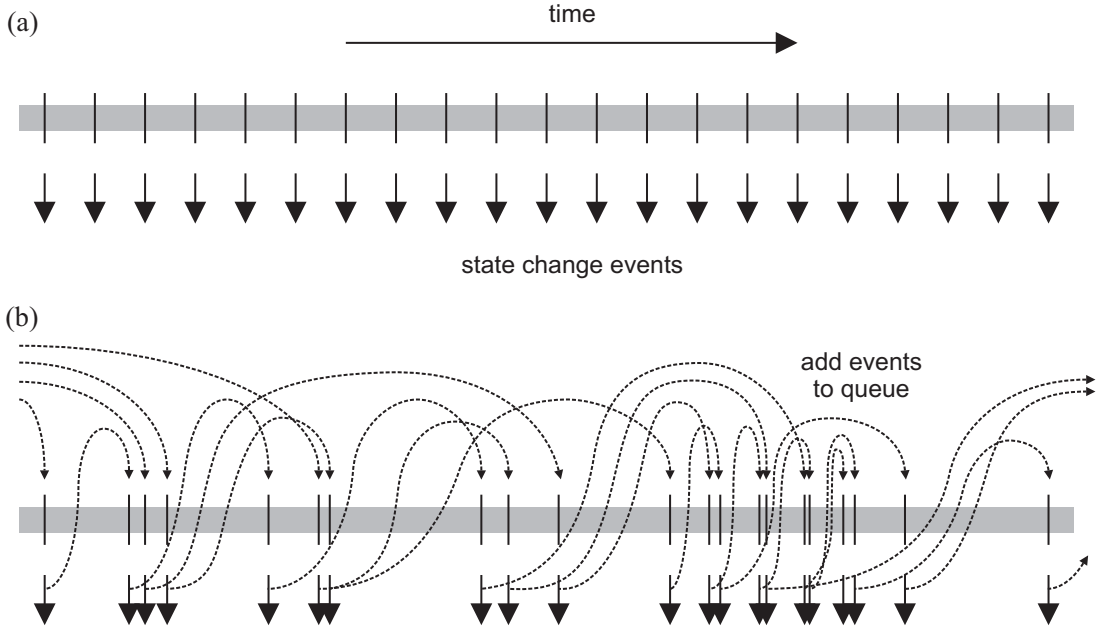

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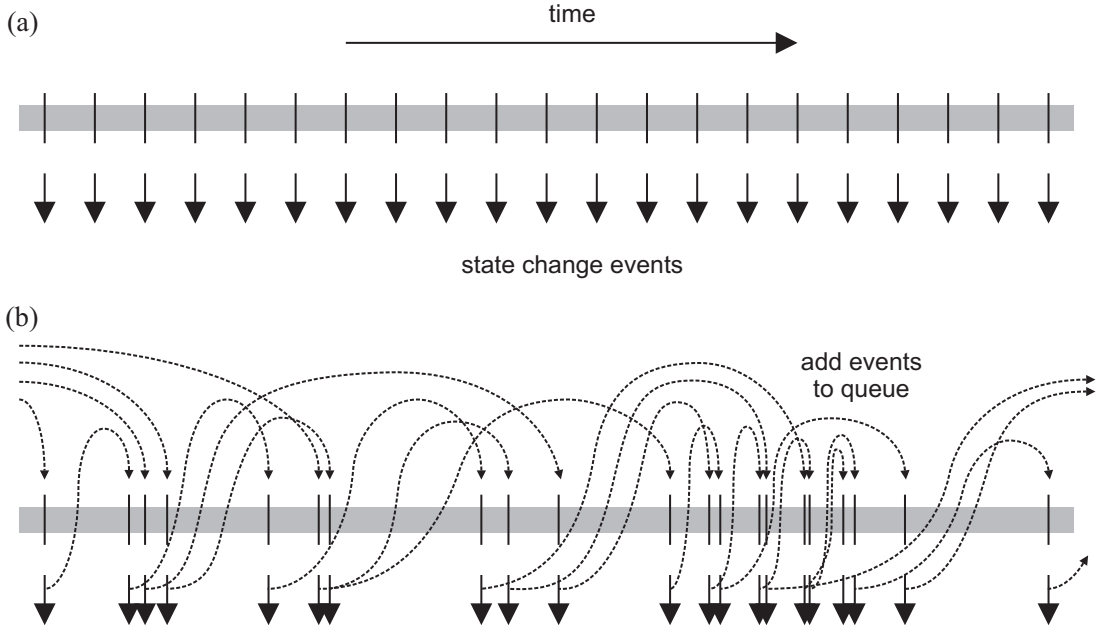

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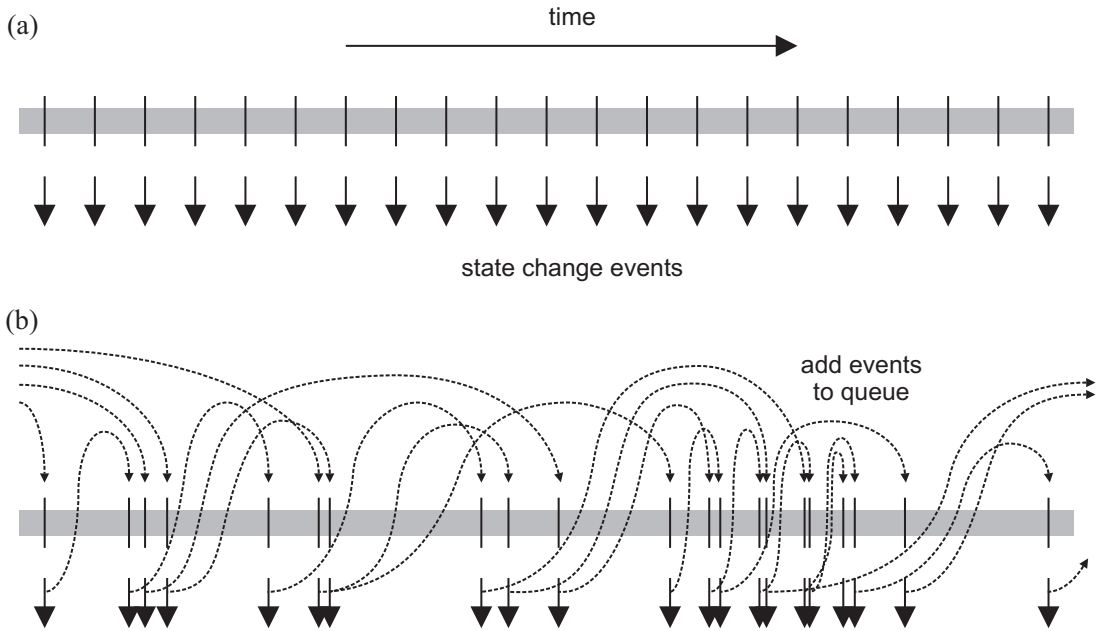

Chapter 7

Models in Practice: Uncertainty and Evaluation

- The Role of Data in Modelling
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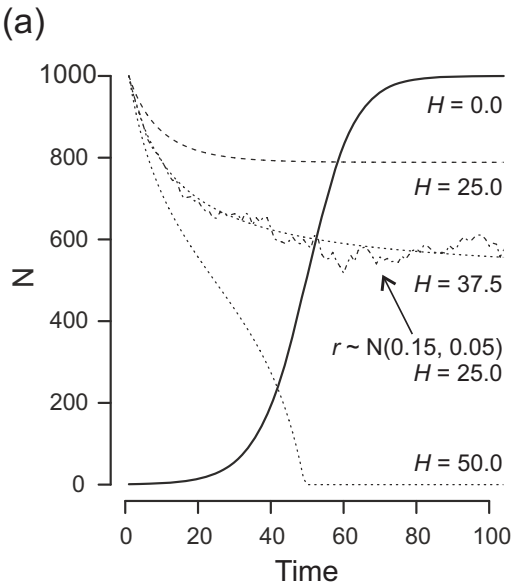

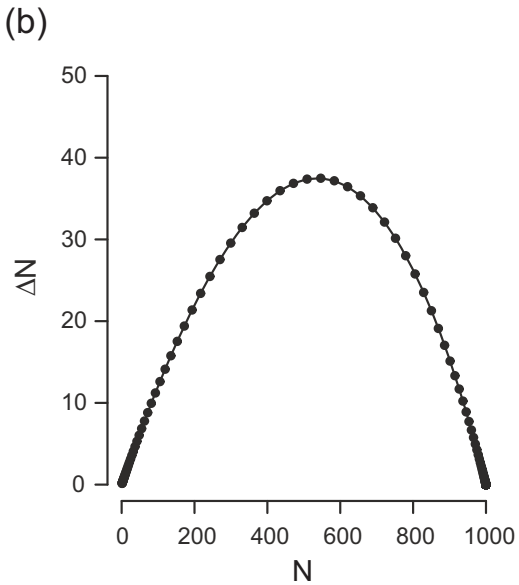

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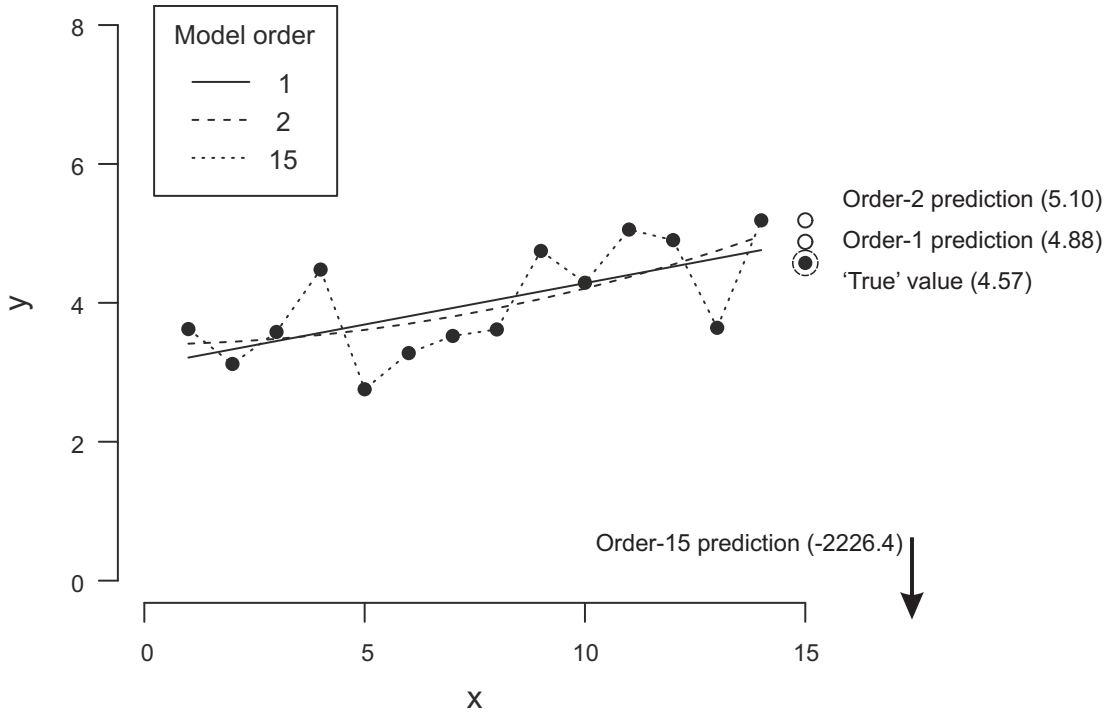

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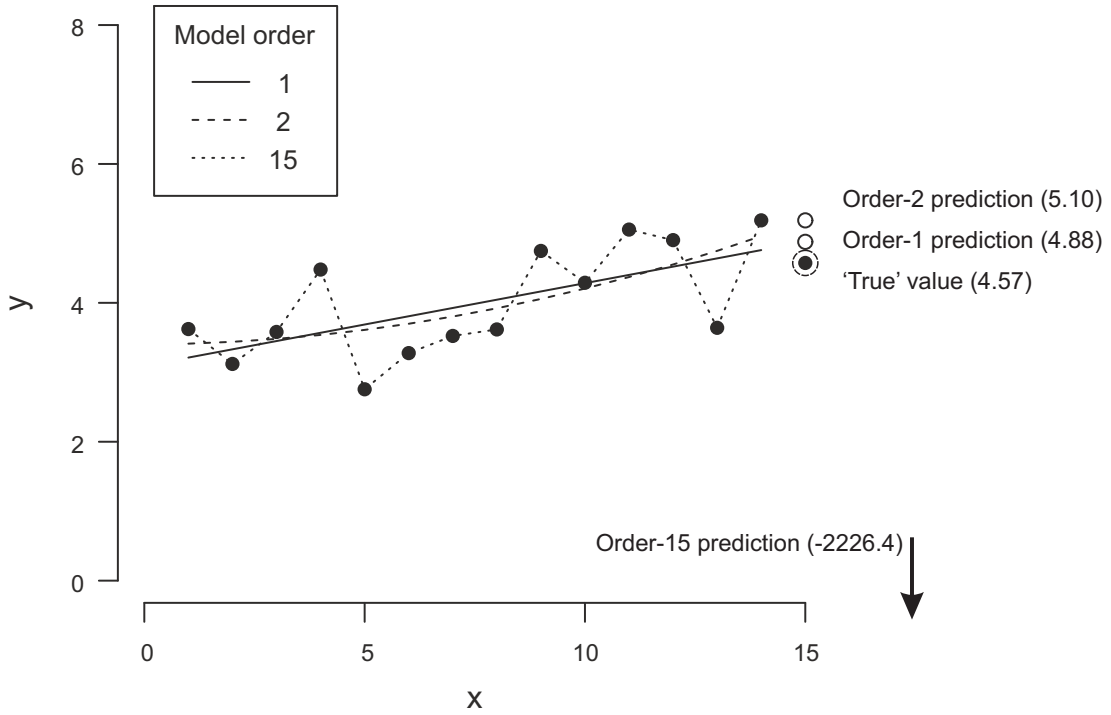

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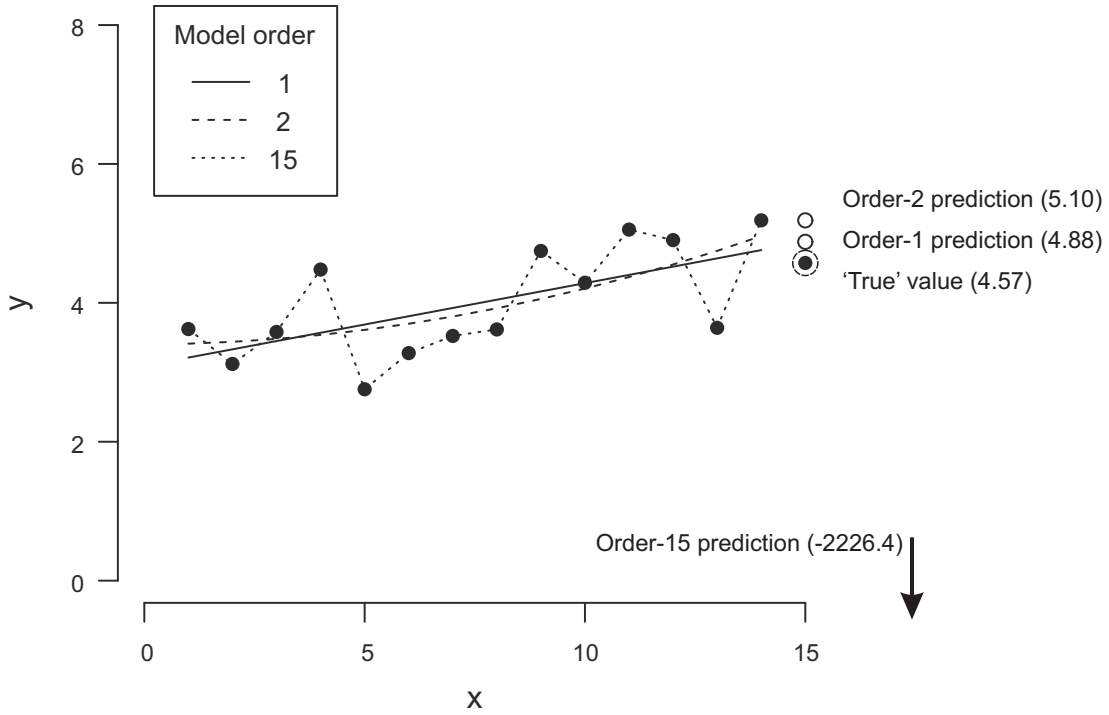

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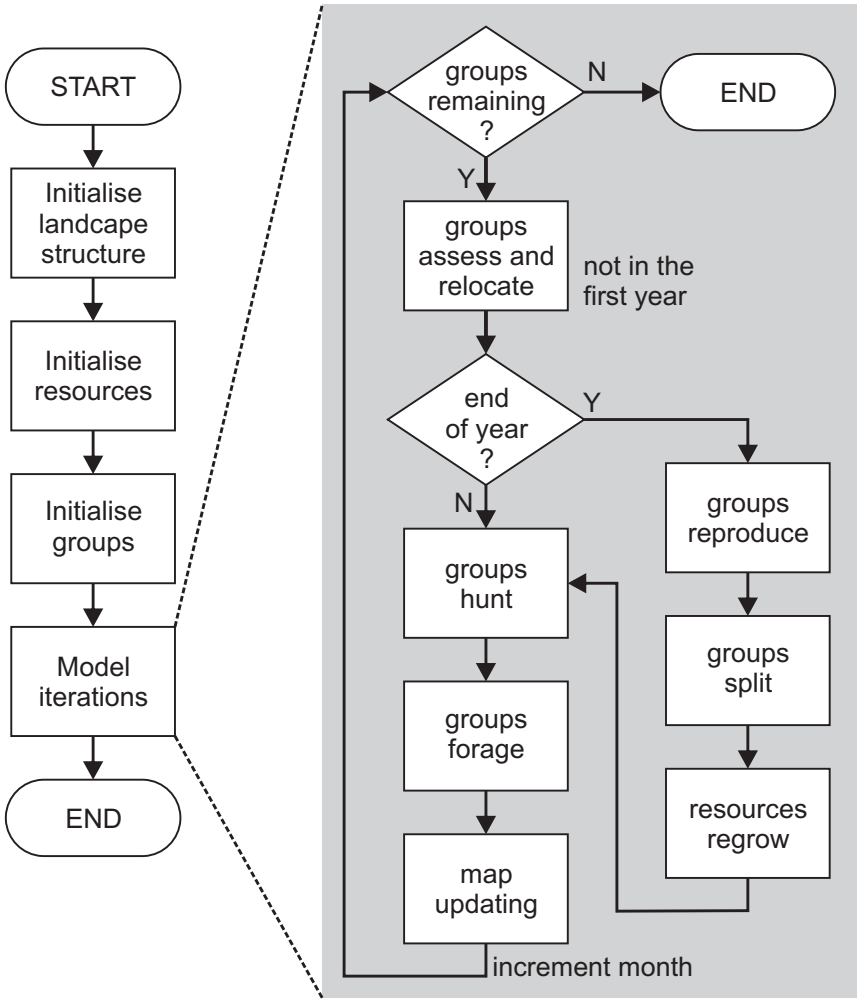

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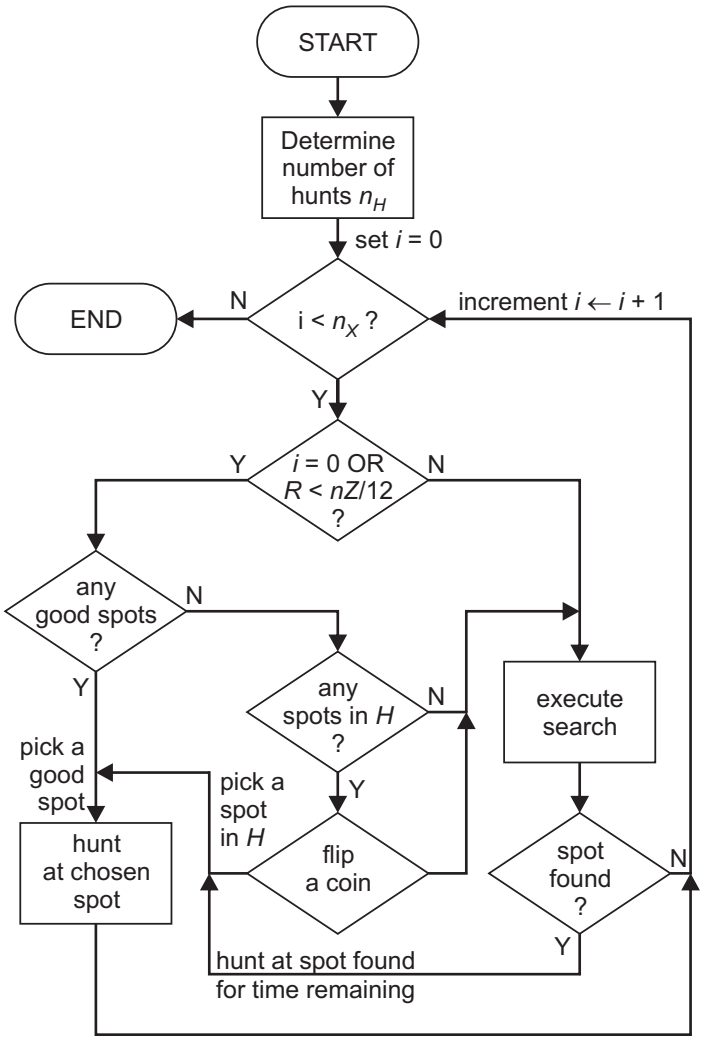

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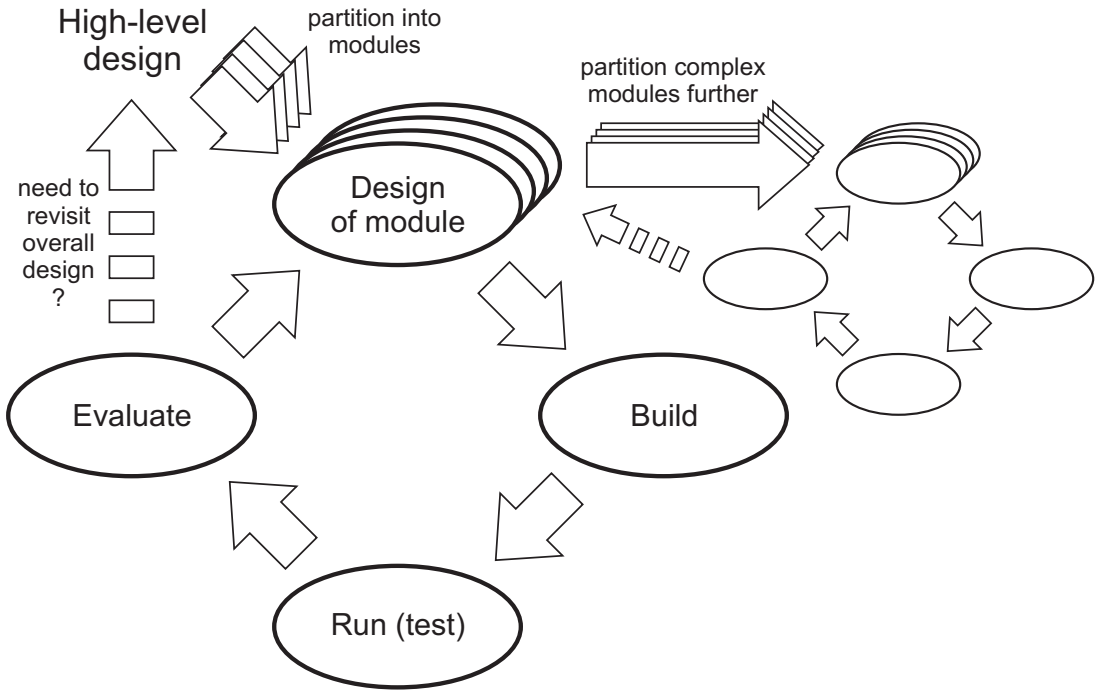

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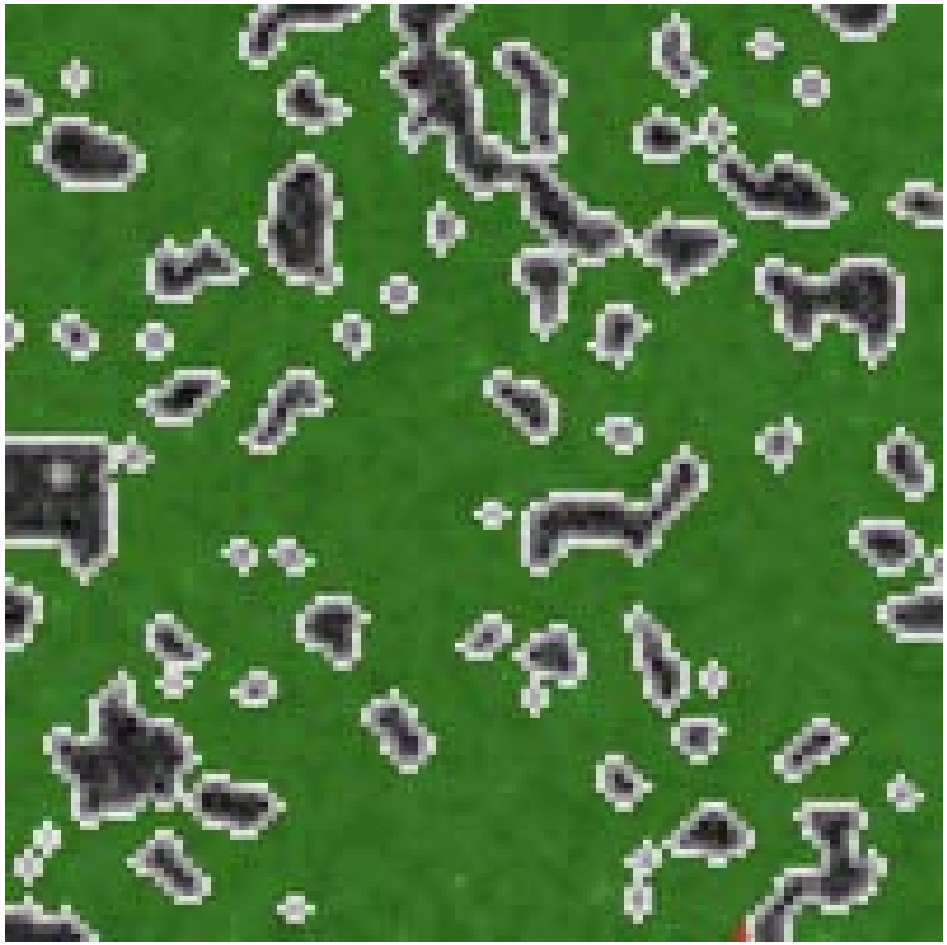

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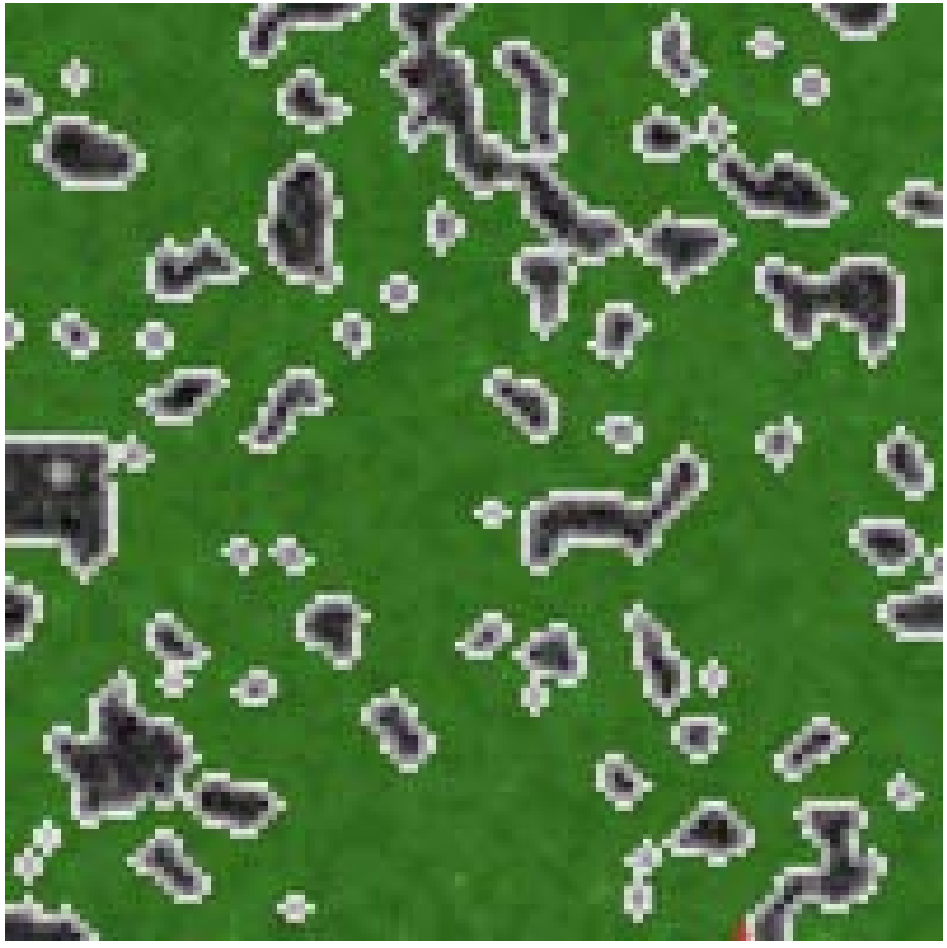

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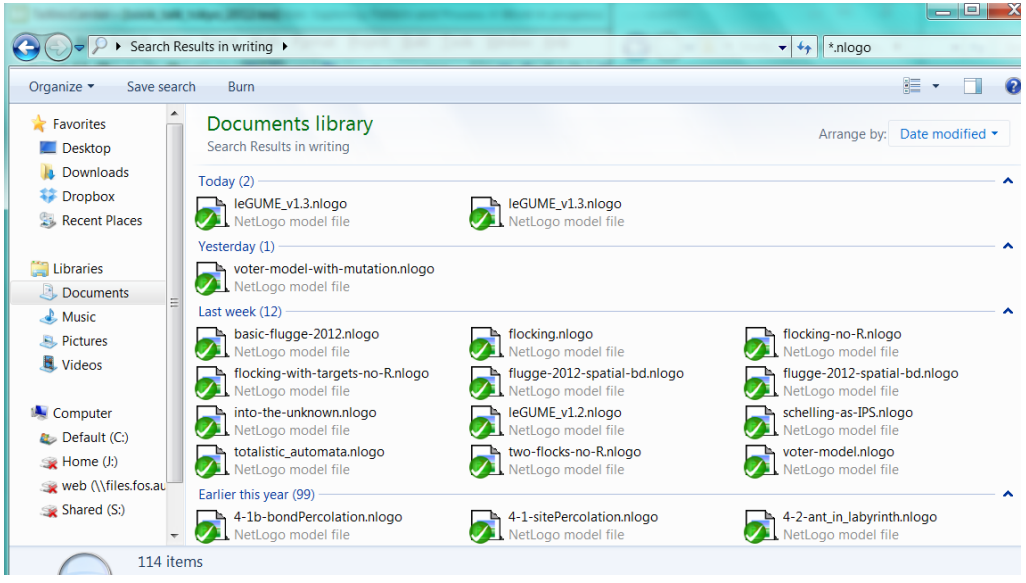
- Written largely in NetLogo and using the R extension
- Good starting points for more complicated models (we hope)
- (Perhaps) a resource that others can add to in time



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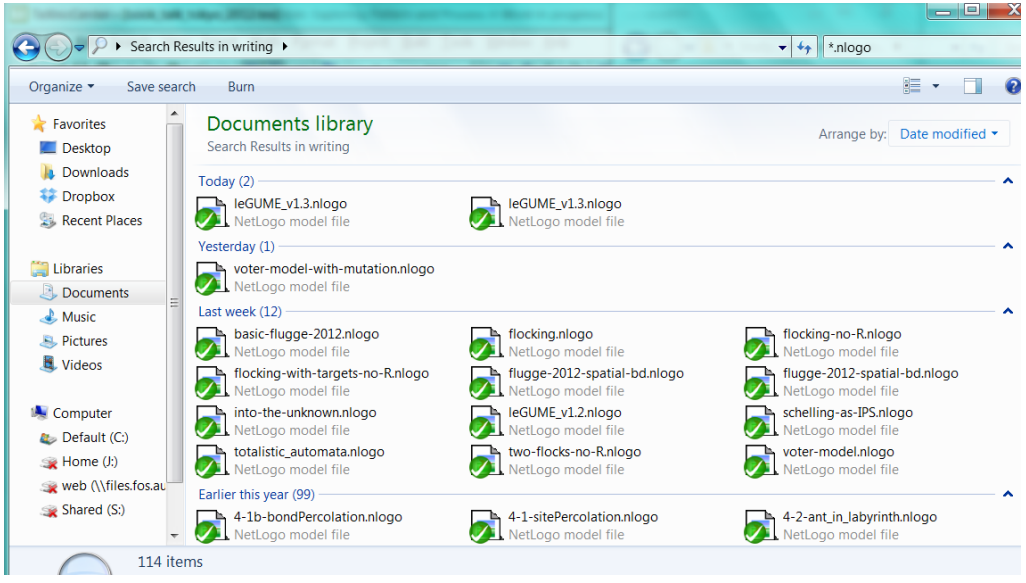

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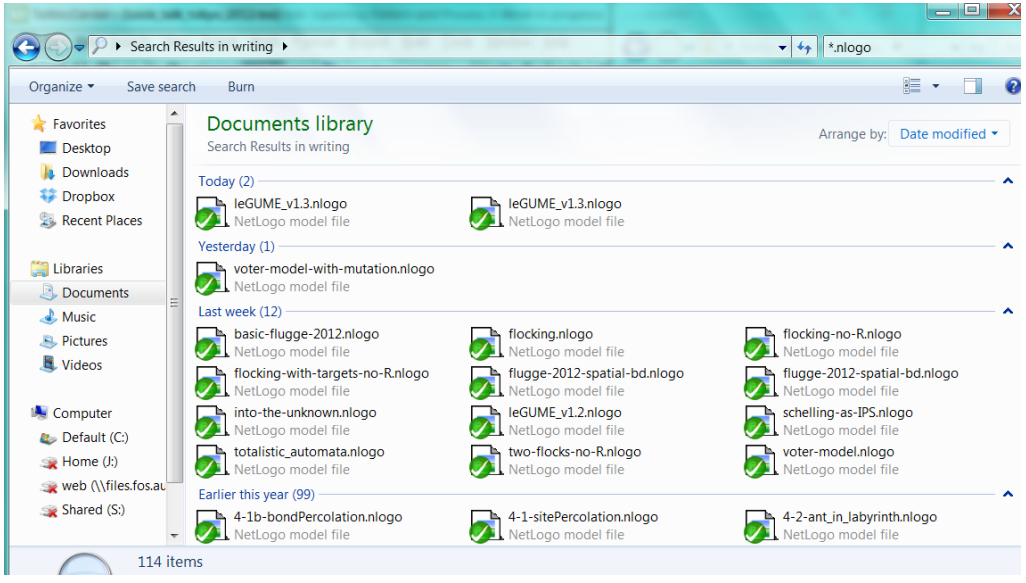

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- Questions?
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