

Contents

Preface	xi
INTRODUCTION	1
Chapter 1: THE IDENTIFICATION OF PATTERN	9
1.1 Alternative Patterns	9
The random pattern. Clusters. Generalized Poisson distributions. Compound Poisson distributions. Poisson cluster processes. Inhibition models. Central place models. The county seat model.	
1.2 The Use of Scattered Quadrats	26
Indices. Choice of Quadrat Size. <i>Example 1.1</i>	
1.3 The Use of Contiguous Quadrats	32
The use of a square grid. Randomly paired quadrats. A transect of quadrats. Refinements to the use of the transect. Tests of significance. Distinguishing between true and apparent contagion. Summary of the use of quadrats. <i>Examples 1.2–1.7</i>	
1.4 The Use of Sampled Point Locations	53
Distances between points and plants. Some distributional results. Testing for randomness. Recommendations. <i>Examples 1.8–1.10</i>	
1.5 The Use of Mapped Plant Locations	70
Mapping methods. Edge effects and interdependence. Tests based on distance measures. Refined nearest-neighbour analysis. Combined count and distance analysis. Generalized quadrat analysis. Reflexive nearest neighbours. <i>Examples 1.11–1.15</i>	
1.6 Circles—Not Points	94
<i>Example 1.16</i>	
1.7 Spatial Tessellations	96
The Dirichlet tessellation. The Delaunay tessellation. The line tessellation. Curved-boundary tessellations <i>Example 1.17</i>	

Chapter 2: THE ESTIMATION OF SPATIAL INTENSITY	105
2.1 Introduction	105
2.2 Quadrat Methods	105
Practical problems	
2.3 The Use of Line Transects	107
The impact of detection on the estimate of intensity. Parametric descriptions of the detection function. Non-parametric procedures. The use of sighting distances.	
<i>Examples 2.1–2.2</i>	
2.4 Distance Methods	118
Point–plant methods. Combined point–plant and plant–plant calculations. Cox’s procedures. Batcheler’s procedure. Precision of the estimates. Recommendations.	
<i>Example 2.3</i>	
2.5 Areal Methods	133
The Dirichlet tessellation. Weighted polygons and weighted triangles.	
<i>Examples 2.4–2.5</i>	
2.6 The Angle-Count Method	144
2.7 Mosaics	146
Plant intensity. Total plant area and boundary length.	
<i>Example 2.6</i>	
Chapter 3: SPATIAL AUTOCORRELATION	151
3.1 General Themes	151
Randomization. The general cross-product statistic. The Monte Carlo approach. The normal approximation.	
<i>Example 3.1</i>	
3.2 Join-Count Statistics	158
One-sided tests. The Poisson approximation. Multicoloured maps. The bishop’s definition of contiguity. The queen’s definition of contiguity. Multiple hypothesis tests.	
<i>Examples 3.2–3.6</i>	
3.3 Moran’s I	170
The distribution of I under randomization. Moran’s I with ranked data.	
<i>Examples 3.7–3.8</i>	
3.4 Generalized Proximity Values	176
Alternative models of proximity. Searching for W matrices. Aspatial W matrices.	
<i>Examples 3.9–3.11</i>	
3.5 Correlograms	186
Spatial correlograms. Definition of distance classes. Rook’s	

	definition S statistics for the correlogram on a regular lattice. Spatial correlograms for join-count statistics. Correlograms, the bishop's definition, and multicoloured maps. The S statistics for the correlogram using the queen's definition. Correlograms with Moran's I . General distance classes. The modified autocorrelation coefficient. The partial correlogram. The spatio-temporal correlogram. Partial spatio-temporal autocorrelation. <i>Examples 3.12–3.22</i>	
3.6	Related Approaches Space–time interaction tests. Relative conditional intensity. Ordinal autocorrelation measures. Alternative sampling models. Difference maps. The choice of a test. <i>Example 3.23</i>	204
Chapter 4:	INTER-TYPE RELATIONS	214
4.1	Bivariate Point Patterns Processes displaying attraction. Processes displaying repulsion. Summary	214
4.2	Analysis Using Quadrats Presence/absence cross-classifications. Inter-quadrat correlations. <i>Examples 4.1–4.4</i>	223
4.3	Analysis Using Transects The runs test. Runs of healthy and diseased plants. <i>Example 4.5</i>	237
4.4	Sophisticated Distance Methods The nearest-neighbour table. Point–plant and plant–plant distributions. Paired point–plant distances. Toroidal shifts. Combined count and distance analysis. <i>Examples 4.6–4.10</i>	242
4.5	Spatial Rank Correlation <i>Example 4.11</i>	258
Chapter 5:	REGRESSION AND AUTOREGRESSION	264
5.1	Regression, Structural, and Sampling Models	264
5.2	Ordinary Least Squares The Gauss–Markov theorem. Inference under Gauss–Markov conditions. Variance ratio tests. Stepwise procedures. <i>Examples 5.1–5.2</i>	265
5.3	Generalised Least Squares Weighted least squares. Logit regression. Intermediate weighted least squares. Generalized least squares with spatially autocor-	277

related errors. Spatial differencing. <i>Example 5.1 (cont.)</i>	
5.4 Maximum Likelihood	283
Maximum likelihood with spatially autocorrelated errors. Computational problems. Inference and maximum likelihood. Likelihood-ratio tests. The unrestricted autocorrelated errors model. More complex autocorrelated errors models. Poisson responses. Poisson responses with logarithmic link. <i>Examples 5.3–5.7</i>	
5.5 Non-Linear Regression	312
The family of power transformations. Parameter bias in log-linear regression. Trend-surface analysis. <i>Examples 5.8–5.9</i>	
5.6 The Analysis of Residuals	329
Abnormal residuals. Spatially autocorrelated residuals. Moran's I for residuals. The I_k distribution under the null hypothesis. A randomization approach to autocorrelated residuals. Residual correlograms. Alternative residual correlograms. Error covariance from correlograms. Autoregressive model residuals and residual maps. <i>Examples 5.10–5.18</i>	
5.7 Autoregressive Response Models	349
Pure autoregression. Conditional autoregression. Moving averages. Boundary effects. <i>Examples 5.19–5.20</i>	
5.8 Alternative Approaches	366
Prediction methods related to Kriging. Space-time models.	
5.9 A Recapitulation of Spatial Regression Models	371
REFERENCES	374
APPENDICES	395
A: The normal distribution function. B: Percentage points of the χ^2 distribution. C: Percentage points for the F distribution. D: Percentage points for the Eberhardt statistic	
AUTHOR INDEX	400
SUBJECT INDEX	406
EXAMPLE INDEX	410