

## CONTENTS

---

<i>List of figures</i>	<i>page</i> xii
<i>List of tables</i>	xvii
<i>List of boxes</i>	xix
<i>Acknowledgements</i>	xx
<b>1 INTRODUCTION AND THEORETICAL ISSUES</b>	<b>1</b>
<b>IN ARCHAEOLOGICAL GIS</b>	1
1.1 About this book	1
1.2 Theoretical issues	3
1.3 Conclusion	10
<b>2 FIRST PRINCIPLES</b>	<b>11</b>
2.1 Introduction	11
2.2 The basics	11
2.3 Cartographic principles	16
2.4 Data models and data structures: the digital representation of spatial phenomena	24
2.5 Conclusion	31
<b>3 PUTTING GIS TO WORK IN ARCHAEOLOGY</b>	<b>33</b>
3.1 Management of archaeological resources	33
3.2 GIS and excavation	36
3.3 Landscape archaeology	41
3.4 Spatial and simulation modelling	45
3.5 Conclusion	50
<b>4 THE GEODATABASE</b>	<b>51</b>
4.1 Introduction	51
4.2 Designing a relational database for attribute data	55
4.3 Spatial data storage and management	57
<b>5 SPATIAL DATA ACQUISITION</b>	<b>61</b>
5.1 Introduction	61
5.2 Primary geospatial data	61
5.3 Secondary data	77

## x

*Contents*

5.4	Map rectification and georeferencing	86
5.5	A note on spatial error and map generalisation	88
<b>6</b>	<b>BUILDING SURFACE MODELS</b>	90
6.1	Introduction	90
6.2	Interpolation	90
6.3	Global methods	91
6.4	Local methods	94
6.5	Interpolation with geostatistics: kriging	97
6.6	Creating digital elevation models	100
6.7	Conclusion	111
<b>7</b>	<b>EXPLORATORY DATA ANALYSIS</b>	112
7.1	Introduction	112
7.2	The query	112
7.3	Statistical methods	122
7.4	Data classification	135
7.5	Conclusion	148
<b>8</b>	<b>SPATIAL ANALYSIS</b>	149
8.1	Introduction	149
8.2	Linear regression	149
8.3	Spatial autocorrelation	158
8.4	Cluster analysis	162
8.5	Identifying cluster membership	168
8.6	Density analysis	173
8.7	Local functions	177
8.8	Predictive modelling	179
8.9	Conclusion	186
<b>9</b>	<b>MAP ALGEBRA, SURFACE DERIVATIVES AND SPATIAL PROCESSES</b>	187
9.1	Introduction: point and spatial operations	187
9.2	Map algebra	188
9.3	Derivatives: terrain form	189
9.4	Continuity and discontinuity	197
9.5	Surface processes: erosion	202
9.6	Conclusion	206
<b>10</b>	<b>REGIONS: TERRITORIES, CATCHMENTS AND VIEWSHEDS</b>	208
10.1	Introduction: thinking about regions	208
10.2	Geometrical regions	209

<i>Contents</i>	xii
10.3 Topographical regions	213
10.4 Conclusion	233
11 ROUTES: NETWORKS, COST PATHS AND HYDROLOGY	234
11.1 Introduction	234
11.2 Representing networks	234
11.3 Analysing networks	238
11.4 Networks on continuous surfaces	252
11.5 Conclusion	262
12 MAPS AND DIGITAL CARTOGRAPHY	263
12.1 Introduction	263
12.2 Designing an effective map	263
12.3 Map design	264
12.4 Thematic mapping techniques	265
12.5 Internet mapping	276
12.6 Conclusion	278
13 MAINTAINING SPATIAL DATA	280
13.1 Introduction	280
13.2 Metadata standards	281
13.3 Creating metadata	283
13.4 Conclusion	287
<i>Glossary</i>	289
<i>References</i>	307
<i>Index</i>	327