

Haowen Yan · Jonathan Li

Spatial Similarity Relations in Multi-scale Map Spaces

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Chun-Qing Li, Wei Yang



Spatial Similarity Relations In Multi Scale Map Spaces:

Spatial Similarity Relations in Multi-scale Map Spaces Haowen Yan, Jonathan Li, 2014-10-10 How does one determine how similar two maps are This book aims at the theory of spatial similarity relations and its application in automated map generalization including the definitions classification and features of spatial similarity relations Included also are calculation models of spatial similarity relations between arbitrary individual objects and between arbitrary object groups and the application of the theory in the automation of the algorithms and procedures in map generalization

Theory of Spatial Similarity Relations and Its Applications in Automated Map Generalization Haowen Yan, University of Waterloo. Department of Geography, 2014 Automated map generalization is a necessary technique for the construction of multi scale vector map databases that are crucial components in spatial data infrastructure of cities provinces and countries Nevertheless this is still a dream because many algorithms for map feature generalization are not parameter free and therefore need human s interference One of the major reasons is that map generalization is a process of spatial similarity transformation in multi scale map spaces however no theory can be found to support such kind of transformation This thesis focuses on the theory of spatial similarity relations in multi scale map spaces aiming at proposing the approaches and models that can be used to automate some relevant algorithms in map generalization After a systematic review of existing achievements including the definitions and features of similarity in various communities a classification system of spatial similarity relations and the calculation models of similarity relations in the communities of psychology computer science music and geography as well as a number of raster based approaches for calculating similarity degrees between images the thesis achieves the following innovative contributions First the fundamental issues of spatial similarity relations are explored i e 1 a classification system is proposed that classifies the objects processed by map generalization algorithms into ten categories 2 the Set Theory based definitions of similarity spatial similarity and spatial similarity relation in multi scale map spaces are given 3 mathematical language based descriptions of the features of spatial similarity relations in multi scale map spaces are addressed 4 the factors that affect human s judgments of spatial similarity relations are proposed and their weights are also obtained by psychological experiments and 5 a classification system for spatial similarity relations in multi scale map spaces is proposed Second the models that can calculate spatial similarity degrees for the ten types of objects in multi scale map spaces are proposed and their validity is tested by psychological experiments If a map or an individual object or an object group and its generalized counterpart are given the models can be used to calculate the spatial similarity degrees between them Third the proposed models are used to solve problems in map generalization 1 ten formulae are constructed that can calculate spatial similarity degrees by map scale changes in map generalization 2 an approach based on spatial similarity degree is proposed that can determine when to terminate a map generalization system or an algorithm when it is executed to generalize objects on maps which may fully automate some relevant algorithms and therefore improve

the efficiency of map generalization and 3 an approach is proposed to calculate the distance tolerance of the Douglas Peucker Algorithm so that the Douglas Peucker Algorithm may become fully automatic Nevertheless the theory and the approaches proposed in this study possess two limitations and needs further exploration More experiments should be done to improve the accuracy and adaptability of the proposed models and formulae The new experiments should select more typical maps and map objects as samples and find more subjects with different cultural backgrounds Whether it is feasible to integrate the ten models formulae for calculating spatial similarity degrees into an identical model formula needs further investigation In addition it is important to find out the other algorithms like the Douglas Peucker Algorithm that are not parameter free and closely related to spatial similarity relation and explore the approaches to calculating the parameters used in these algorithms with the help of the models and formulae proposed in this thesis

Advances in Cartography and GIScience Michael P. Peterson, 2017-05-30 This book presents a selection of manuscripts submitted to the 2017 International Cartographic Conference held in Washington DC at the beginning of July and made available at the conference These manuscripts have been selected by the Scientific Program Committee and represent the wide range of research that is done in the discipline It also forms an important international collection representing research from at least 30 40 countries

Description Approaches and Automated Generalization Algorithms for Groups of Map Objects Haowen Yan, 2019-01-04 This book focuses on the generalization of map features providing descriptions and classifying groups of map objects into six categories point clusters groups of contours road networks river networks continuous areal features and discrete areal features Discussing the methods and algorithms in map generalization in equal measure it also describes the approaches for describing map features The book is a valuable reference for graduates and researchers who are interested in cartography and geographic information science systems especially those in automated map generalization and spatial databases construction

Scale Cristian Suteanu, 2023-01-01 This book provides up to date in depth and accessible information on the concept of scale and focuses on its applications in geography Earth science environmental science and other fields in which the environment plays a significant role Although the book presents methods and applications as a response to practical challenges it is primarily concept centered it identifies a set of distinct yet related notions of scale analyzing and elucidating their evolving meanings in a systematic way Concepts are defined with a focus on their practical operational applicability and the introduction of methods is supported by concrete examples The book links theoretical insights to illustrating applications involving a broad range of themes from maps fractals and chaos theory to fine art and literature It approaches the subject in a spatial temporal and spatio temporal context including a wide diversity of spatial features from Earth and other planets as well as time series and space time patterns This monograph is expected to be useful especially because in practice the various scale focused concepts are not neatly separated and immiscible It is therefore helpful for scholars in physical and human geography Earth and environmental sciences and other fields to benefit from a clear conceptual framework that

distinguishes and illuminates the various scale related concepts and their interconnections Selected chapters can also support a deeper understanding of the concept of scale for graduate and undergraduate students in geography the natural sciences and the humanities Information on recommended additional literature and comments about specific sources offer a guide to further reading on the topics addressed in the book Geoinformatics and Data Analysis Salah Bourennane,Petr Kubicek,2022-06-09 This book contains the proceedings of the 5th International Conference on Geoinformatics and Data Analysis ICGDA 2022 held in January 21 23 Paris France Geoinformatics helps to support basic scientific inquiry as well as address the complex social and environmental challenges It becomes very important technology to decision makers across a wide range of disciplines such as computer science information technology software engineering biogeography geography conservation architecture spatial analysis and reinforcement learning The papers included in this proceeding share the latest research results and practical application examples on the methodologies and algorithms in the area of geoinformatics and data analysis including software and information engineering environmental geography and geographic information system which makes the book a valuable reference for researchers engineers and university students who are working in the field

Beyond Databases, Architectures and Structures. Advanced Technologies for Data Mining and Knowledge Discovery Stanisław Kozielski,Dariusz Mrozek,Paweł Kasprowski,Bożena Małysiak-Mrozek,Daniel Kostrzewa,2016-04-28 This book constitutes the refereed proceedings of the 12th International Conference entitled Beyond Databases Architectures and Structures BDAS 2016 held in Ustro Poland in May June 2016 It consists of 57 carefully reviewed papers selected from 152 submissions The papers are organized in topical sections namely artificial intelligence data mining and knowledge discovery architectures structures and algorithms for efficient data processing data warehousing and OLAP natural language processing ontologies and semantic Web bioinformatics and biomedical data analysis data processing tools novel applications of database systems **Advances in Cartography and Geographic Information Engineering** Jiayao Wang,Fang Wu,2021-07-30 This book reviews and summarizes the development and achievement in cartography and geographic information engineering in China over the past 60 years after the founding of the People's Republic of China It comprehensively reflects cartography as a traditional discipline has almost the same long history with the world's first culture and has experienced extraordinary and great changes The book consists of nineteen thematic chapters Each chapter is in accordance with the unified directory structure introduction development process major study achievements problem and prospect representative works as well as a lot of references It is useful as a reference both for scientists and technicians who are engaged in teaching researching and engineering of cartography and geographic information engineering Steel Corrosion and Degradation of its Mechanical Properties Chun-Qing Li,Wei Yang,2021-09-19 This book presents the state of the art knowledge on corrosion of steel cast iron and ductile iron with a focus on corrosion induced degradation of their mechanical properties The information presented in the book is largely derived from the most current research on the effect

of corrosion on degradation of mechanical properties The book covers the basics of steel corrosion including that of cast iron and ductile iron that are not well covered in most literature Models for corrosion induced degradation of mechanical properties are presented in the book with a view to wider applications The knowledge presented in the book can be used to prevent corrosion induced failures of corrosion affected structures offering enormous benefits to the industry business society and community Key strengths of the book are that it can be employed by a variety of users for different purposes in designing and assessing corrosion affected structures and that the knowledge and techniques presented in the book can be easily applied by users in dealing with corrosion affected structures and the uniqueness in examining the corrosion effect on degradation of various mechanical properties With examples of practical applications the book is particularly useful for all stakeholders involved in steel manufacturing and construction including engineering students academicians researchers practitioners and asset managers

Advanced Data Mining and Applications Quan Z. Sheng, Gill Dobbie, Jing Jiang, Xuyun Zhang, Wei Emma Zhang, Yannis Manolopoulos, Jia Wu, Wathiq Mansoor, Congbo Ma, 2024-12-12 This six volume set LNAI 15387 15392 constitutes the refereed proceedings of the 20th International Conference on Advanced Data Mining and Applications ADMA 2024 held in Sydney New South Wales Australia during December 3 5 2024 The 159 full papers presented here were carefully reviewed and selected from 422 submissions These papers have been organized under the following topical sections across the different volumes Part I Applications Data mining Part II Data mining foundations and algorithms Federated learning Knowledge graph Part III Graph mining Spatial data mining Part IV Health informatics Part V Multi modal Natural language processing Part VI Recommendation systems Security and privacy issues

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