



An Introduction to Spatial Database, Spatial Data Types and Spatial Index Analysis using Multidimensional Geo-Database

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Abstract — This paper covers the overview of Spatial Database System which offers Spatial Data Structure along with the Spatial Datatypes. It is most commonly used in Geographic Information Systems (GIS) and other applications. Many applications operate on spatial data which include lines, points, regions and polygons etc. Spatial data are large in size and complex in structure and relationship hence spatial indexes are required to retrieve the desired result-set from the large dataset in optimum timeframe. The main emphasis on hierarchical data structures, including the number of indexing techniques like IHCode, R-tree, R+tree, Quadtree, Octree, UBTREE etc. which are often used to improve query processing time in spatial database. Such techniques are also known as spatial indexing methods. Comparative study also covered in the paper for the R-Tree and R-Tree indexing techniques, and results shown that the better performance of the queries using appropriate index.*

Keywords- Spatial Index, GIS, Quadtree, R-tree, R*tree.

I. INTRODUCTION

Spatial data denotes to all types of data objects or elements that are present in a geographical space or horizon. It enables the tracing of any locating, individuals or devices anywhere in the earth. Spatial data is also known as geospatial data, spatial information or geographic information. Spatial data is used in GIS and other location or Positioning Services. Spatial data consists of points, lines, polygons and other geographic and geometric data primitives, which can be mapped by location, stored with an object as metadata or used by a communication system to detect user position. Spatial data can be classified as scalar or vector data. Each one provides different information related to geographical or spatial positions.

The data that contains the particulars of any location (latitude and longitude, or height and depth) objects is the spatial data. When the object is rendered, this spatial data is used to project the locations of the objects on a 2-dimensional piece of paper. A GIS is frequently used to store, retrieve, and render geographic spatial data. Other types of spatial data which can be stored using the Spatial Data Option besides GIS data. It includes data from Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) systems. Instead of operating on objects on a geographic scale, CAD/CAM systems work on a smaller scale such as for an auto-mobile machine or much smaller scale as for printed circuit boards.

A. Point Data

Point is basically a location of any particular place which can be identify with the name or landmark. Generally point data is used to denote unconnected locations. Points have no dimensions; hence it can neither be used to measure length nor the area of the location. Points have various examples like: hotel, School and training center etc. The example below shows the location of ATM and Bank Branch. Point features are also used to represent abstract points. For example, point locations could represent city locations or name of any places as mentioned in the picture (Fig 1) below:

Multidimensional Spatial Data And Decision Analysis

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Multidimensional Spatial Data And Decision Analysis:

Multidimensional Spatial Data and Decision Analysis Peter Nijkamp, Piet Rietveld, 1979 *Multidimensional Spatial Data and Decision Analysis* Peter Nijkamp, 1979 *Multidimensional Spatial Data and Decision Analysis* Peter Nijkamp, 1979

Multidimensional Spatial Data and Decision Analysis Peter Nijkamp, 1979 **Multicriteria Decision Analysis in Geographic Information Science** Jacek Malczewski, Claus Rinner, 2015-02-02 This book is intended for the GIS Science and Decision Science communities It is primarily targeted at postgraduate students and practitioners in GIS and urban regional and environmental planning as well as applied decision analysis It is also suitable for those studying and working with spatial decision support systems The main objectives of this book are to effectively integrate Multicriteria Decision Analysis MCDA into Geographic Information Science GIScience to provide a comprehensive account of theories methods technologies and tools for tackling spatial decision problems and to demonstrate how the GIS MCDA approaches can be used in a wide range of planning and management situations *Interactive Decision Analysis* M. Grauer, A.P. Wierzbicki, 2013-03-14 During the week of September 20-23 1983 an International Workshop on Interactive Decision Analysis and Interpretative Computer Intelligence was held at the International Institute for Applied Systems Analysis IIASA in Laxenburg Austria More than fifty scientists representing seventeen countries participated The aim of the Workshop was to review existing approaches to problems involving multiple conflicting objectives to look at methods and techniques for interactive decision analysis and to demonstrate the use of existing interactive decision support systems The Workshop was motivated firstly by the realization that the rapid development of computers especially microcomputers will greatly increase the scope and capabilities of computerized decision support systems It is important to explore the potential of these systems for use in handling the complex technological environmental economic and social problems that face the world today Research in decision support systems also has another less tangible but possibly more important motivation The development of efficient systems for decision support requires a thorough understanding of the differences between the decision making processes in different nations and cultures An understanding of the different rationales underlying decision making is not only necessary for the development of efficient decision support systems but is also an important factor in encouraging international understanding and cooperation **Multiple Criteria Decision Analysis in Regional Planning** Fumiko Seo, Masatoshi Sakawa, 2012-12-06 This book is devoted to presenting theoretical fundamentals for the methods of multiple criteria decision making MCDM in the social sciences with particular intent to their applicability to real world decision making The main characteristics of the complex problems facing humans in the world today are multidimensional and have multiple objectives they are large scale and have noncommensurate and conflicting objectives such as economic environmental societal technical and aesthetic ones The authors intend to establish basic concepts for treating these complex problems and to present methodological discussions for MCDM with some applications to administrative or regional planning MCDM is

composed of two phases analytical and judgmental In this book we intend to consolidate these two phases and to present integrated methodologies for manipulating them with particular interest in managerial decision making which has not yet been properly treated in spite of its urgent necessity Although a number of books in MCDM fields have already been published in recent years most of them have mainly treated one aspect of MCDM Our work specifically intends to treat the methodology in unified systems and to construct a conceptual structure with special regards to the intrinsic properties of MCDM and its economic meanings from the social scientific point of view

Methods of Interregional and Regional Analysis Walter Isard, Iwan J. Azis, Matthew P. Drennan, Ronald E. Miller, Sidney Saltzman, Erik Thorbecke, 2017-07-05 This landmark textbook introduces students to the principles of regional science and focuses on the key methods used in regional analysis including regional and interregional input output analysis econometrics regional and spatial programming and industrial and urban complex analysis gravity and spatial interaction models SAM and social accounting welfare analysis and applied general interregional equilibrium models The coherent development of the materials contained in the set of chapters provides students with a comprehensive background and understanding of how to investigate key regional problems For the research scholar this publication constitutes an up to date source book of the basic elements of each major regional science technique More significant it points to new directions for future research and ways interregional and regional analytic approaches can be fused to realise much more probing attacks on regional and spatial problems a contribution far beyond what is available in the literature

Water and Related Land Resource Systems Y. Haimen, J. Kindler, 2014-05-23 Water and Related Land Resource Systems covers IFAC Symposium that aims to address resource problem as well as methodologies and procedures for respective solutions Consists of 60 chapters the book is organized in sessions according to the technical program of the conference The book first tackles multiobjective planning in water and land resources which is followed by acquisition and analysis of surface water quality data The next part covers hierarchical water resource planning and management models while the succeeding part is about environmental and ecological aspects of water and land resources The fifth session discusses the impact of energy development on water and land resources Session VI covers modeling and systems identification problems in water resources and Session VII covers acquisition and analysis of hydrologic data The eighth session tackles ground water and its conjunctive use with surface water while the next session talks about sedimentation and land management The tenth session is about multiobjective planning in water and land resources Predicting and forecasting models in water resources is the topic of Session XI while Session XII discusses evaluation and calibration problem in water resource modeling The closing chapter covers water and land issues in urban areas Professionals whose work revolves around resource management and researchers whose work is in line with natural resource will find great information in this book that will be relevant in their trade

Data Warehousing Design and Advanced Engineering Applications: Methods for Complex Construction Bellatreche, Ladjel, 2009-08-31 Data warehousing

and online analysis technologies have shown their effectiveness in managing and analyzing a large amount of disparate data attracting much attention from numerous research communities

Data Warehousing Design and Advanced Engineering Applications Methods for Complex Construction covers the complete process of analyzing data to extract transform load and manage the essential components of a data warehousing system A defining collection of field discoveries this advanced title provides significant industry solutions for those involved in this distinct research community

Beyond Benefit Cost Analysis Domenico Patassini,Donald Miller,2017-11-30 Illustrated by case studies from Europe North America and the Middle East this book examines how non market values can be identified measured and incorporated into planning evaluation methodologies The traditional means of assessing planning options benefit cost analysis requires that all effects be expressed in monetary terms and this volume offers alternative approaches It presents strategies for accomplishing the major purposes of planning evaluation including the provision of an explicit replicable basis for public assessment in alternative ways Growing demand for public involvement and for accountability in decision making requires better means for accommodating a broad range of concerns in planning evaluation Methodologies examined include effectiveness cost and multicriteria analysis and the book explores how these have been applied in practice in developing special issue plans complex regional development strategies and efforts to analyze the environmental justice implications of major infrastructure projects Use of scenarios and problem structuring methods by stakeholder groups are also explored

Recent Developments in Spatial Data Analysis Gerhard Bahrenberg,Manfred M. Fischer,Peter Nijkamp,1984 Geographic Information Systems: Concepts, Methodologies, Tools, and Applications Management Association, Information Resources,2012-09-30

Developments in technologies have evolved in a much wider use of technology throughout science government and business resulting in the expansion of geographic information systems GIS is the academic study and practice of presenting geographical data through a system designed to capture store analyze and manage geographic information Geographic Information Systems Concepts Methodologies Tools and Applications is a collection of knowledge on the latest advancements and research of geographic information systems This book aims to be useful for academics and practitioners involved in geographical data

Environment & Planning ,2001 Time Series Analysis Oliver Duncan Anderson,1984

Economic Development Perspectives: Development economics and the planning challenge ,1991 **Analyse Spatiale Et Dynamique Des Populations** Denise Pumain,1991 **Regional Development Dialogue** ,1983 **Indian Journal of Regional Science** ,1994 *Land and Water Issues Related to Energy Development* International Society of Petroleum Industry Biologists. Meeting,1982

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