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1 **A multiobjective optimization model for locating affordable housing investments while maximizing accessibility to jobs by public transportation**

Zhong, Q; Karner, A; (...); Golub, A

Mar 2019 | ENVIRONMENT AND PLANNING B-URBAN ANALYTICS AND CITY SCIENCE 46 (3) , pp.490-510

This paper develops a new optimal location model for siting affordable housing units to maximize the accessibility of low-income workers to appropriate jobs by public transportation. Transit-accessible housing allows disadvantaged populations to redu which can lead to savings on transportation-related expenditures. The housing location model developed here maximizes transit accessibility while reducing the clustering of affordable housing units in space. Accessibility is maximized using a high-resc public transit accessibility, originally developed for service equity analysis. The second objective disperses subsidized housing projects across space using a new minimax dispersion model based on spatial interaction principles. The multiobjective mod

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2 [Not available]

Gurobi Optimization,

Gurobi Optimizer Reference Manual

3 **The Network-Max-P-Regions model**

She, B; Duque, JC and Ye, XY

2017 | INTERNATIONAL JOURNAL OF GEOGRAPHICAL INFORMATION SCIENCE 31 (5) , pp.962-981

This paper introduces a new p-regions model called the Network-Max-P-Regions (NMPR) model. The NMPR is a regionalization model that aims to aggregate n areas into the maximum number of regions (max-p) that satisfy a threshold constraint and to taking into account the influence of a street network. The exact formulation of the NMPR is presented, and a heuristic solution is proposed to effectively compute the near-optimized partitions in several simulation datasets and a case study in Wuhan, CH

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4 **Defining geographical boundaries with social and technical variables to improve urban energy assessments**

Reyna, JL; Chester, MV and Rey, SJ

Oct 1 2016 | ENERGY 112 , pp.742-754

Within residential electricity consumption there exists significant variability from home-to-home due to the differences in building thermal properties, appliances, and inhabitants. Electricity analyses at sub city scales using predefined geographies, such split areas with homogenous characteristics leading to analyses that don't effectively contrast the drivers of energy use. The objective of this study is to use the spatial relationships between demographics, building types, and electricity consumption to variability for use in residential energy assessment. Using Los Angeles and New York City as case studies, differences in energy use variability within predefined geographies (e.g., census tract) are compared to geographies defined by clustering on socio-

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5 **Identifying an optimal analysis level in multiscalar regionalization: A study case of social distress in Greater Santiago**

Garreton, M and Sanchez, R

Mar 2016 | COMPUTERS ENVIRONMENT AND URBAN SYSTEMS 56 , pp.14-24

Assembling spatial units into meaningful clusters is a challenging task, as it must cope with a consequential computational complexity while controlling for the modifiable areal unit problem (MAUP), spatial autocorrelation and attribute multicolinearity reveal significant interactions among diverse spatial phenomena, such as segregation and economic specialization. Various regionalization methods have been developed in order to address these questions, but key fundamental properties of the aggre poorly understood. In particular, due to the lack of an objective stopping rule, the question of determining an optimal number of clusters is yet unresolved. Therefore, we develop a clustering algorithm which is sensitive to scalar variations of multivariat

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6 **Studying Neighborhoods Using Uncertain Data from the American Community Survey: A Contextual Approach**

Spielman, SE and Singleton, A

Sep 3 2015 | ANNALS OF THE ASSOCIATION OF AMERICAN GEOGRAPHERS 105 (5) , pp.1003-1025

In 2010 the American Community Survey (ACS) replaced the long form of the decennial census as the sole national source of demographic and economic data for small geographic areas such as census tracts. These small area estimates suffer from large makes the data difficult to use for many purposes. The value of a large and comprehensive survey like the ACS is that it provides a richly detailed, multivariate, composite picture of small areas. This article argues that one solution to the problem of large shift from a variable-based mode of inquiry to one that emphasizes a composite multivariate picture of census tracts. Because the margin of error in a single ACS estimate, like household income, is assumed to be a symmetrically distributed random vari

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7 **Delimitation of Functional Regions Using a p-Regions Problem Approach**

Kim, H; Chun, Y and Kim, K

Jul 2015 | INTERNATIONAL REGIONAL SCIENCE REVIEW 38 (3) , pp.235-263

Various spatial data analyses have been used for the identification of functional regions. Functional regions are identified by grouping many areal units into fewer clusters to classify the areal units in terms of similar properties, as well as to constrain the units in each cluster. This article proposes a spatial optimization model, called the p-functional regions problem, to solve a regionalization problem by considering geographic flows. The magnitude of geographic flows, such as journey-to-work, is widely functional relationships between areas so that regionalization models incorporating various criteria, such as the maximum intraregion flows or the total inflows from other units, may be used to identify the p regions. We also propose an analytical target

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8 **The p-Compact-regions Problem**

Li, WW; Church, RL and Goodchild, MF

Jul 2014 | GEOGRAPHICAL ANALYSIS 46 (3) , pp.250-273

The p-compact-regions problem involves the search for an aggregation of n atomic spatial units into p-compact, contiguous regions. This article reports our efforts in designing a heuristic framework-MERGE (memory-based randomized greedy and edge problem through phases of dealing, randomized greedy, and edge reassignment. This MERGE heuristic is able to memorize (ME of MERGE) the potential best moves toward an optimal solution at each phase of the procedure such that the search efficien dealing phase grows seeded regions into a viable size. A randomized greedy (RG of MERGE) approach completes the regions' growth and generates a feasible set of p-regions. The edge-reassigning local search (E of MERGE) fine-tunes the results toward t

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9 **Identifying regions based on flexible user-defined constraints**

Folch, DC and Spielman, SE

Jan 2 2014 | INTERNATIONAL JOURNAL OF GEOGRAPHICAL INFORMATION SCIENCE 28 (1) , pp.164-184

The identification of regions is both a computational and conceptual challenge. Even with growing computational power, regionalization algorithms must rely on heuristic approaches in order to find solutions. Therefore, the constraints and evaluation c be translated into an algorithm that can efficiently and effectively navigate the solution space to find the best solution. One limitation of many existing regionalization algorithms is a requirement that the number of regions be selected a priori. The recer does not have this requirement, and thus the number of regions is an output of, not an input to, the algorithm. In this paper, we extend the max-p algorithm to allow for greater flexibility in the constraints available to define a feasible region, placing the

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10 **Using High-Resolution Population Data to Identify Neighborhoods and Establish Their Boundaries**

Spielman, SE and Logan, JR

2013 | ANNALS OF THE ASSOCIATION OF AMERICAN GEOGRAPHERS 103 (1) , pp.67-84

Neighborhoods are about local territory, but what territory? This article offers one approach to this question through a novel application of "local" spatial statistics. We conceptualize a neighborhood in terms of both space and social composition; it is a bundle of social attributes that distinguish it from surrounding areas. Our method does not impose either a specific social characteristic or a predetermined spatial scale to define a neighborhood. Rather, we infer neighborhoods from detailed informati their locations. The analysis is based on geocoded complete-count census data from the late nineteenth century in four cities: Albany, New York; Buffalo, New York; Cincinnati, Ohio; and Newark, New Jersey. We find striking regularities (and some anom

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11 **THE MAX-P-REGIONS PROBLEM***

Duque, JC; Anselin, L and Rey, SJ

Aug 2012 | JOURNAL OF REGIONAL SCIENCE 52 (3) , pp.397-419

In this paper, we introduce a new spatially constrained clustering problem called the max-p-regions problem. It involves the clustering of a set of geographic areas into the maximum number of homogeneous regions such that the value of a spatially ext a predefined threshold value. We formulate the max-p-regions problem as a mixed integer programming (MIP) problem, and propose a heuristic solution.

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12 **Commercial Territory Design for a Distribution Firm with New Constructive and Destructive Heuristics**

Cano-Belman, J; Rios-Mercado, RZ and Salazar-Aguilar, MA

Feb 2012 | INTERNATIONAL JOURNAL OF COMPUTATIONAL INTELLIGENCE SYSTEMS 5 (1) , pp.126-147

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A commercial territory design problem with compactness maximization criterion subject to territory balancing and connectivity is addressed. Four new heuristics based on Greedy Randomized Adaptive Search Procedures within a location-allocation sc
combinatorial optimization problem are proposed. The first three (named GRLH1, GRLH2, and GRDL) build the territories simultaneously. Their construction phase consists of two parts: a location phase where p territory seeds are identified, and an allo
basic units are iteratively assigned to a territory. In contrast, the other heuristic (named SLA) builds the territories one at a time. Empirical results reveals that GRLH1 and GRLH2 find near-optimal or optimal solutions to relatively small instances, where

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☐ 13 Basic Search Algorithms
Edelkamp, S and Schrodl, S
2012 | HEURISTIC SEARCH: THEORY AND APPLICATIONS , pp.47-87

☐ 14 GNU linear programming kit
2012 | GNU LINEAR PROGRAMMI
URL: https://www.gnu.org/software/glpk/

☐ 15 Automatic Region Building for Spatial Analysis
Guo, DS and Wang, H
Jul 2011 | TRANSACTIONS IN GIS 15 , pp.29-45

High-resolution spatial data have become increasingly available with modern data collection techniques and efforts. However, it is often inappropriate to use the default geographic units to perform spatial analysis due to unstable estimates with small
blocks or tracts). Regionalization is aggregating small units into relatively larger areas while optimizing a homogeneity measure (such as the sum of squared differences). For exploratory spatial analysis, regionalization may help remove spurious data va
discover hidden patterns in data (such as areas of unusually high cancer rates). Towards this goal, this research introduces several improvements to a recent group of regionalization methods - REDCAP (Guo 2008) and conducts evaluation experiments w

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☐ 16 A Hybrid Metaheuristic Approach to Optimize the Districting Design of a Parcel Company
González-Ramírez, R.G.; Smith, N. R.; (...); Sánchez, J.M.
2011-04 | Journal of applied research and technology 9 (1) , pp.19-35

In this article we address a districting problem faced by a pickup and delivery parcel company over a determined service region. The service region is divided into districts, each served by a single vehicle that departs from a central depot. Two objectives
balance of the workload content among the districts. We present a mathematical formulation of the problem and a heuristic algorithm to solve the problem. Numerical results are presented in comparison to CPLEX 11.1 solutions for the smaller size inst
heuristic performs well. The algorithm is able to solve moderate size instances in reasonable computational time, given the strategic nature of the problem.

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☐ 17 Measuring Spatial Dynamics in Metropolitan Areas