BARD: Better Automated Redistricting

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Abstract

BARD is the first (and currently only) open source software package for redistricting and redistricting analysis. BARD is a program that makes political redistricting more accessible and understandable by providing methods to create, display, compare, edit, automatically refine, evaluate, and profile political districting plans. BARD supports both scientific analysis of existing redistricting plans and citizen participation in creating new plans. BARD facilitates map creation and refinement through command-line, gui, and automatic methods. Since redistricting is a computationally complex partitionaling problem not amenable to an exact optimization solution, BARD makes use of a variety of selectable metaheuristics, including genetic algorithms, GRASP, and simulated annealing, that can be use to refine existing or randomly-generated redistricting plans based on user-determined criteria.

Furthermore, BARD supports the ability to randomly generate redistricting plans, and to generate profiles of plans for different scoring weights. This functionality can be used both to explore trade-offs among criteria and to make inferences regarding the intent behind existing redistricting plans.

Because of the computational intensity of these methods, performance is an important criterion in the design and implementation of BARD. The program implements performance enhancements such as evaluation caching, explicit memory management, and distributed computing across snow clusters.

Keywords: redistricting, optimization.