AN OPTIMIZATION-BASED SYSTEMATIC PROCEDURE FOR POLITICAL DISTRICTING

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Extended Abstract

This paper presents a linear integer programming (IP) approach to the political redistricting problem. We develop three IP models solved successively to partition a large number of indivisible spatial units (census tracts) to configure districts in such a way that: i) all districts have almost equal populations; ii) each district is spatially contiguous and compact; and iii) community integrity is preserved. The last requirement is represented by minimal division of jurisdictional units (counties) and configuration of majority-minority districts. We apply this modeling approach to the state legislative districting for the State of Illinois using the 2000 and 2010 census data. The results show that the model-generated districting plans are considerably more compact than the actual districting plans implemented in the last election while simultaneously dividing counties much less. Illinois State Constitution requires proportional representation of minority groups to the extent possible. We impose additional constraints to generate maximum number of majority-minority districts. The results show that the model-generated plans improve the minority representation compared to the previously implemented and recently drawn districting plans, where the number of majority-minority districts more closely reflects the population shares of both the Hispanic and African-American minority groups in the state.