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Making Solution Pluralism in Policy Making Accessible: Optimization of Design and Services for Constituent Well-Being

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Abstract

Policy makers are increasingly turning to computational support mechanisms for managing uncertainty, and constituent focused-decisions. Utilization and standardization of human-computer interaction principles to create *solution pluralism* (the condition of having a consideration set containing a multiplicity of credible solutions) is a fundamental to fulfilling this need. There is a need for standardized applications and user interfaces to deliver a higher quality of service, which assists policy makers in maintaining or increasing constituent well-being.

Author Keywords

Public policy; solution pluralism; software standardization; optimization; well-being

ACM Classification Keywords

K.4.1 Public Policy Issues

Introduction

Consider a city undertaking an electoral redistricting exercise for its City Council. Census data is obtained and mapped to geographic units ("wards" and "ward

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divisions”) defined by the City. Electronic infrastructure is made available for residents to propose districting plans and for viewing them online, along with key statistical assessments of the plans, such as population distributions across districts, measures of compactness, and so on, all relevant to stakeholder values. Residents use multiple techniques—human judgment, optimization algorithms of various kinds, machine learning, visualization, etc.—to propose districting plans, which they post on a web site. Consequently, many distinct, legally valid, attractive plans appear, and vigorous public discourse ensues regarding choice of an actual plan.

Points arising: (1) The scenario sketches an ideal for public deliberation. This ideal is well worth pursuing and has broad-based support. (2) Visualization (of districting plans) is essential to the success of the scenario; it contributes heavily to making the plans accessible to the general public. Well-designed user interfaces are required for meaningful public participation; not only for public examination of posted results, but also for providing data and other information to those who would propose specific plans, e.g., by running optimization algorithms on the basic data. (3) It is a virtue of the scenario that it leads to a plurality of solutions in the consideration set. A solution pluralism regime is needed because important information will normally be absent from the supplied data (e.g., population counts for areal units are available, but neighborhood specifications are not) [1, 2]. (4) The scenario is practicable enough to be realizable. In fact, it came close to being realized in Philadelphia, USA.¹ Various groups used city-specific

data to solve optimization models for redistricting Philadelphia City Council, and testified at public hearings regarding their results. While it is unclear how much the exercise influenced City Council in deciding upon its redistricting plan, there was general agreement that the process was successful in producing a vigorous, well-informed public discussion.

We envision continued and expanded research aimed at realizing structured, computationally assisted decision making, processed in full depth and scope. Moreover, we envision two kinds of generalizations from such a scenario. First, electoral redistricting is generalized to the zone design problem, which applies to any case of geographically based service areas, including police, fire, and welfare districts in the public sector and sales, warehousing, and service response districts in the commercial sector [3,4]. Second, geography may be generalized to taxonomies and other relational structures (such as networks). Thus abstracted, we call these CMD (configuration mapping and design) problems. Configurations (areal entities, taxonomies, networks) are described (mapped) and used to design policy implementations (e.g., service districts). CMD problems share with electoral districting that: (1) they are computationally very challenging both in theory (NP-complete) and in practice; (2) they need subjective assessment as well as computational optimization, for which effective user interfaces are required.

Computational Well-Being Assessment

Based on the CMD experience from the above section, we propose furthering current applications of human-computer interaction to well-being measurement. Well-

(<http://www.gse.upenn.edu/pcel/programs/ppce>), in which a web site was maintained, and many districting plans were submitted and made viewable.

¹ In 2011 a contest was sponsored by Azavea (<http://www.azavea.com>), WHYY (<http://www.whyy.org>), and the Penn Project for Civic Engagement

being is an underutilized yet effective concept for measuring populations' perceptions and expectations of themselves, services available to them, and their effects [5]. HCI interfaces for mapping and design of a communal well-being data collection and evaluation tool is a natural next step for policy making bodies and stakeholders in constituent and community management. By ushering in standardized data collection techniques, collection will be formalized to assure quality standards.

Well-being data is currently populated by means of surveys and interviews [6]. Furthering data collection by adding an HCI element [7] affords collection of data that can be used to create well-being maps of communities and/or institutions. Such maps can be used to track the general mood of a given population; they can also serve as an *ex-post* measurement of changes from policy implementation.

Well-being mapping is naturally extended to well-being oriented service design. Going beyond accessibility and web localization services, optimized well-being service

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design adds constituent well-being to the pertinent equilibrium concept. Services are launched when the well-being fitness function is at least approximately Pareto optimal. Applications for policy makers are manifold; optimization and solution pluralism can be used as part of the public conversation in the battle against food deserts; placement of multi-modal mobility stations (e.g., carsharing locations); power-loading distributions on smart grids; and other data-mining processes for appropriate provision of constituent focused services.

Towards a Comprehensive Policy Framework

To realize the continuation (zone design problems) and expansion (well-being assessment) of HCI-informed policy making, an integrated approach to the standardization of data and architecture is necessary. The full CMD abstraction should be addressed. For these reasons, local and international policy bodies should formally document HCI standards where they intersect public policy discussions and codification.

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