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Title: Regional Search and Visualization Methodologies for Multi-Criteria Geographic Retrieval

Abstract: Geo-related information is one of the essential needs of citizens to find the important places and to understand the local infrastructure. Nowadays, Geographic Information Retrieval (GIR) systems and local search services are the most common way to access the relevant spatial information for end users. In the current means of GIR systems, users could easily search and visualize the geo-entities of interest on a map interface via querying or browsing of individual categories. However, there are several decision making scenarios when the users need to analyze and compare the geographic regions with respect to multiple criteria of interests, which is not well supported by the current local search systems as their presentation methods are liable towards definite locations and entities. Hence more complex search types and supporting analysis are desired that enable a combined view onto the underlying data. This may be for tourist purposes, to find a new place to live during relocation planning, or to learn more about a city in general.

The objective of this research is to investigate and develop sophisticated visual interfaces and ranking methods to enable end-users in discovering knowledge hidden in multi-dimensional geospatial databases. To characterize the atmosphere, composition, and spatial distribution of geographic regions we proposed to extract spatially relevant information from publicly available Web data sources, e.g., OpenStreetMap, spatial documents, events, social media, etc. The interaction procedure goes beyond the conventional list based local search interfaces and proposes to access the geospatial data sources with regional overview. Users can compare the characterization of urban areas with respect to multiple spatial dimensions of interest and can search for the most suitable region.

To tackle the human centered aspects we proposed novel query methods where users could go beyond the popular place names and locations for the characterization of their region of interest. We investigated different geovisualization methods to support easy access and interaction with the spatial database. The search experience is further enhanced via efficient regional ranking algorithms to accomplish the complex search task in computationally effective manner. The proposed ranking phenomenon is a novel methodology to generalize from point data to spatial distributions, captivating on multi-criteria optimization algorithms.