International Cartographic Association
Association Cartographique Internationale

Feature and Label Density in Large-Scale Online Maps

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Keywords: Multiscale Panable Map (MSP), feature and label density, statistical saliency model

Abstract:

Large scale maps from Google, Microsoft Bing, OpenStreetMap, ESRI and Mapbox among other multi-scale panable (MSP) map providers represent an important source of information for local environments. For most map users, these services represent the only source for maps, large scale or otherwise. Evaluating these services helps to determine the quality of the underlying spatial data and the rendering process.

Multiple procedures are used to compare feature and label density between these MSP map services. All approaches generate large scale maps at random locations using the associated Application Programmer Interface (API). Each representation is then evaluated by continent. In the first experiment, map pairs at the 19th zoom level for North America, Europe and Africa for Google, Bing and MapBox are visually compared. It was found that Google maps from North America had consistently higher feature and label density than those from Microsoft Bing and Mapbox. Google Maps also held an advantage for Europe. Maps from Microsoft Bing, based on data from HERE and TomTom, were more detailed in Sub-Saharan Africa in comparison to both Google Maps and Mapbox. Relying exclusively on data from OpenStreetMap, MapBox had the lowest feature and label density for all three continents (Peterson 2021).

In a second experiment, the maps were evaluated quantitatively through Rosenholtz's statistical saliency model (Rosenholtz 2007). A measure of visual clutter, the model measures the efficiency with which an image can be encoded. It is inversely related to the amount of redundancy and grouping in the image. A python script generated a list of 5,000 latitude/longitude coordinates inside pre-defined polygons corresponding to all land areas on Earth, except Antarctica. From these set of coordinates, a corresponding single tile from each MSP provider, Google, Bing, OSM, and ESRI, at the 19th zoom level was queried through the corresponding API and downloaded for analysis. It was found that dithered shadings used by both OSM and ESRI produced very high values for this measure thus confounding the quantitative analysis. In the end, only maps from Google and Bing, using solid shadings, could be compared using the Rosenholtz measure.

In a third experiment, the same python script downloaded random tiles from Google, Bing, OSM, and ESRI. Optical Character Recognition (OCR) was applied to count of the number of characters on each tile. This produced a measure of map annotation for each service. Overall, it was found that the method of randomly selecting tiles oriented the analysis to more rural or undeveloped areas. This favored the more commercial map providers compared to those relying on crowdsourced data.

References

Peterson, M. P. (2021) A Comparison of Feature Density for Large Scale Online Maps. *Cartographic Perspectives*, (97). https://doi.org/10.14714/CP97.1707

Rosenholtz, R., Li, Y., & Nakano, L. (2007) Measuring visual clutter. *Journal of Vision*, 7(2), 17–17. https://doi.org/10.1167/7.2.17.