“Ohsome” OpenStreetMap Data Evaluation: Fitness of Field Papers for Participatory Mapping

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Motivation

Crowdsourced information can support disaster management in different ways. Up-to-date information is provided by local citizens, which can be used to enhance flood models [1] or to capture flood risk perception [2]. Anyone with internet access can contribute new data to the collaborative mapping project OpenStreetMap (OSM), edit, and freely use the data provided by OSM. For an adequate use, the quality of the data needs to be known beforehand, and thus, the quality assessment of OSM is an important research topic. If reference data are available, extrinsic quality evaluation is possible [3]. However, often there is a lack of such resources. Therefore, intrinsic quality measures are required. Raifer et al. [4] developed the OpenStreetMap History Database (OSHDB) to analyze the temporal evolution and spatial heterogeneity of the OSM data at large scale.

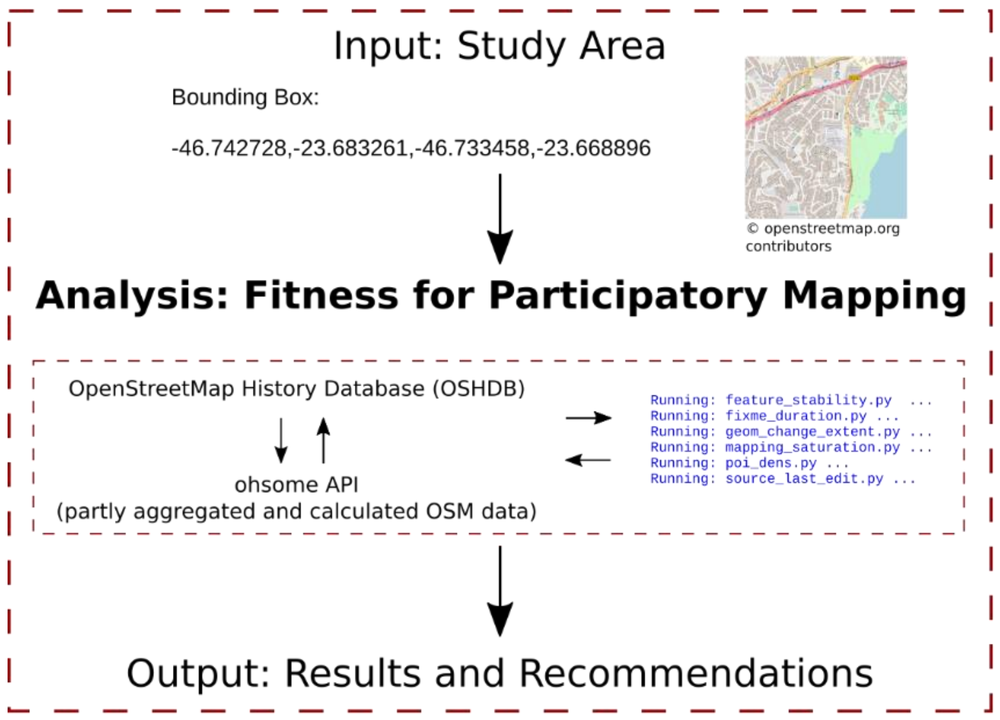
Methods

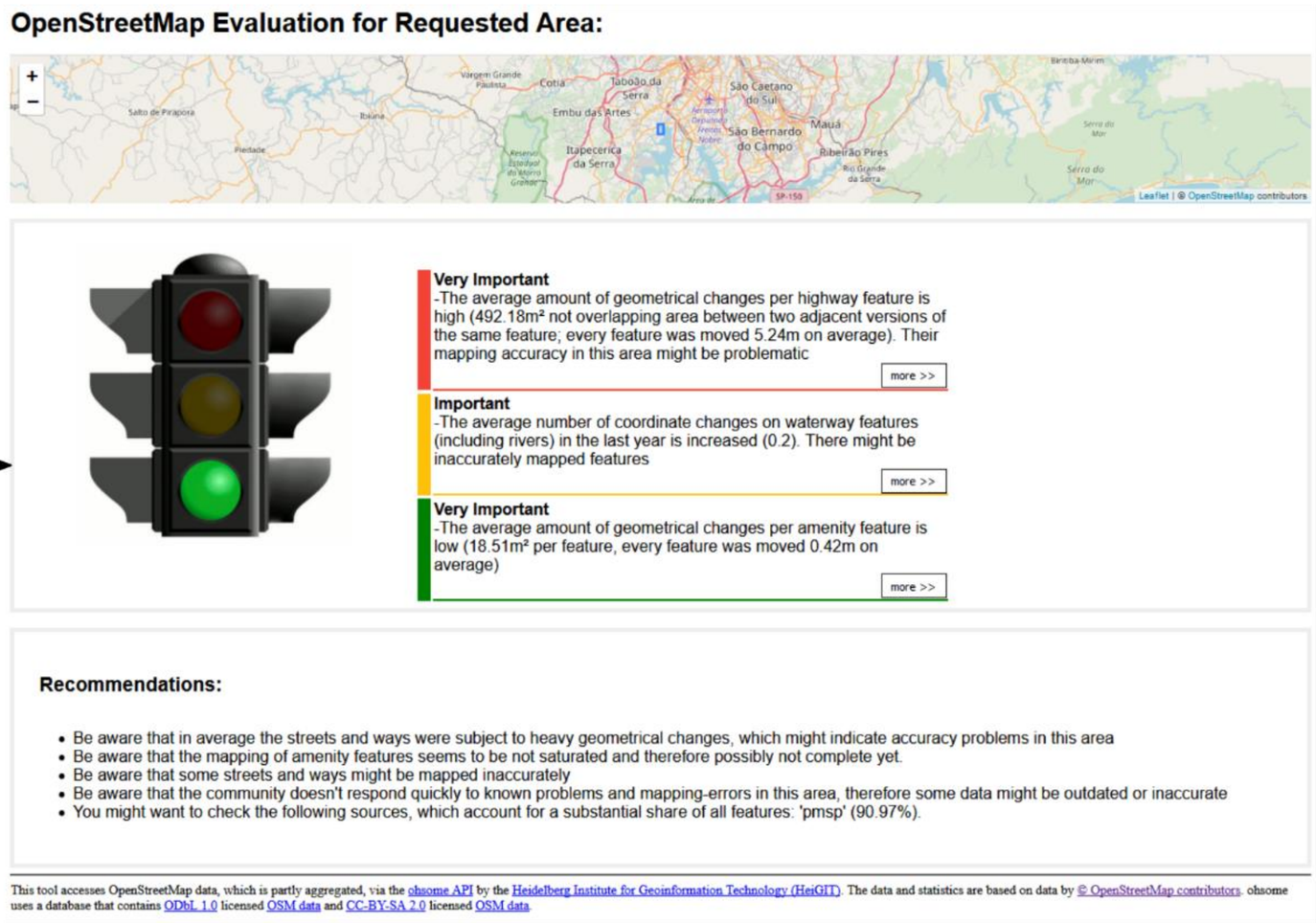
Our study uses the OSHDB for analyzing OSM data in Brazil, where we investigate flooding in São Paulo and Rio Branco within the Waterproofing Data Project. We apply the method of participatory mapping, which is based on OSM Field Papers [2]. Participants can mark their experiences on the Field Papers and these resulting Sketch Maps can automatically be georeferenced and thus, the collected data can be processed in a fast way. However, due to heterogeneous OSM data in different areas, it is necessary to evaluate the fitness for purpose of the Field Papers first.

We developed a tool which bundles several intrinsic analyses to evaluate the quality of the OSM data within a study region for its fitness for usage in Field Papers:

- Positional accuracy:
  - Average number of coordinate changes per feature of relevant categories
  - Average extent of positional changes (centroid distance and area covered by changes) per feature of relevant categories
- Community activity: Duration of fixme and similar tags
- Up-to-dateness: Average time since last edit
- Difficulty of orientation: Density of orientation providing features
- Hints for manual inspection : Important sources accounting for a substantial share of all features
- Mapping completeness: Yearly changes in feature length or density

Workflow





Results

Results are delivered in written form combined with recommendations for the person who wants to apply the Field Papers for participatory mapping. These recommendations include details to check beforehand and possible problems to be aware of during the usage of the Field Papers. The results are summed up by a general score, which is displayed via a traffic light, to provide an easily accessible insight into the fitness of the OSM data. The analyses can be directly performed on multiple bounding boxes. In contrast to many other approaches, this tool does not require a local database to work on, but accesses the OSHDB via the ohsome-API developed by the HeiGIT. This is both time and resource saving for the user, who can directly use the program.

For a tested region in São Paulo our results indicate a good fitness for usage in Field Papers (rated as green on the traffic light), and some recommendations are given.

Conclusions and Future Work

The presented tool enables detailed analyses to assess the suitability of OSM data for the application of OSM Field Papers for participatory mapping. It offers a sustainable approach because local authorities, for example, can apply these methods independently without expert knowledge. The presented tool will be integrated in a web portal which will facilitate the participatory mapping activities and present the data in combination with authoritative data. We are further developing the tool to allow for new forms of application.

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