

Hierarchical Semantic Hashing: Visual Localization from Buildings on Maps

Supplementary Material

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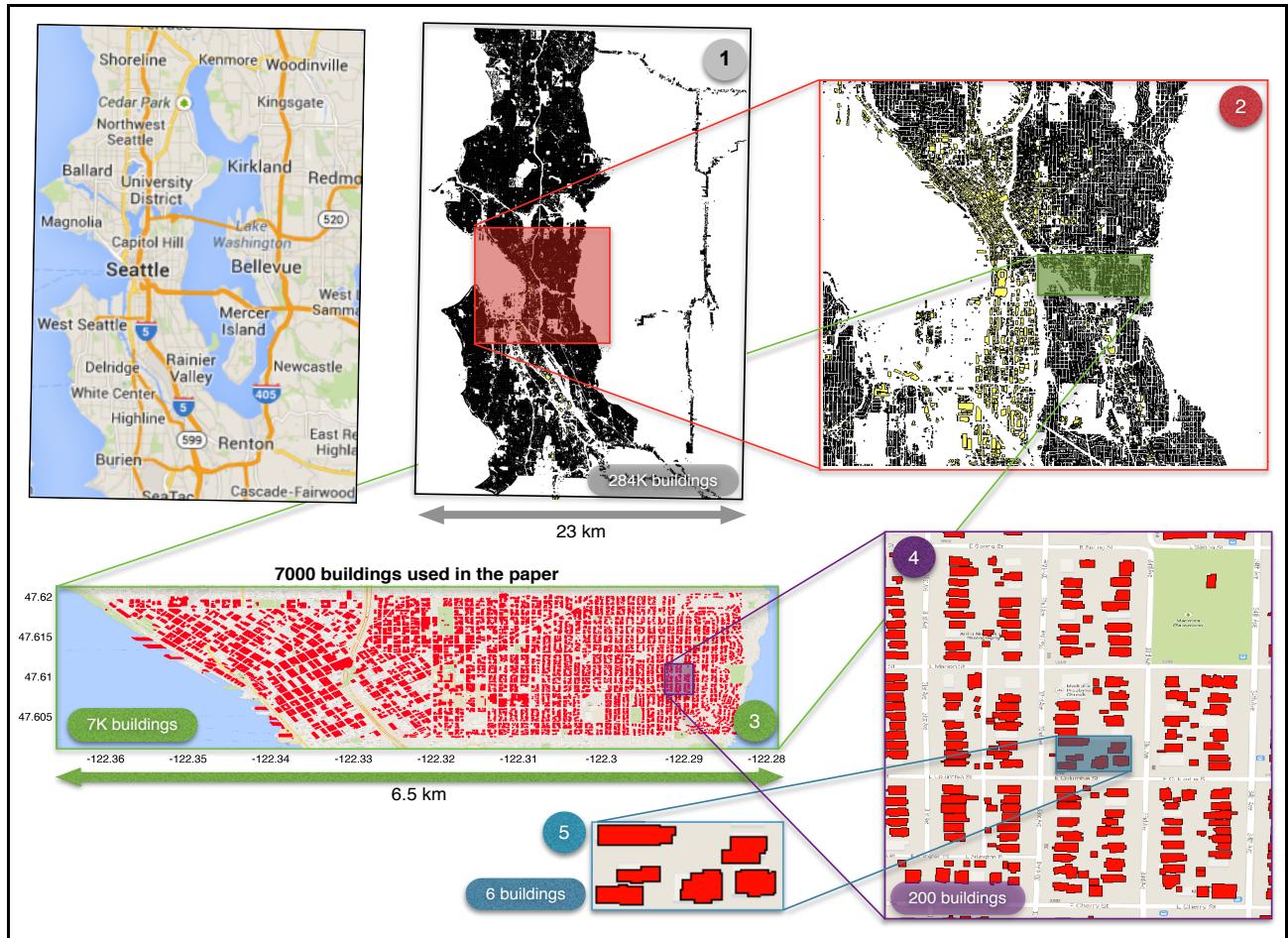
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I. DATASET

A. Full Coverage of Building Footprint Data

The original building footprint data gathered from Seattle GIS Program consists of 284,017 buildings from Seattle; covering a huge area of approximately 23 km x 38 km. The whole dataset with different levels of detail from city size down to buildings in very dense residential areas are shown in Sup. Fig. 1. In this document, we tried to extend some of our original tests to cover more buildings from the dataset to show the scalability of our proposed localization system.



Sup. Fig. 1 Building footprint data full coverage.

B. Seattle GIS Program

In our search for a good and complete GIS dataset we found that in the Seattle's Data Site under the **files and documents** section (<https://data.seattle.gov/browse?limitTo=blob>), there exists many useful datasets that can be used for many interesting applications. Although we only made use of the building footprints dataset in our current work, we wanted to mention some of these datasets:

- Building footprints
 - <https://data.seattle.gov/dataset/2009-Building-Outlines/y7u8-vad7>
- Street Network Database
 - <https://data.seattle.gov/dataset/Street-Network-Database/afip-2mzr>
- Traffic Signals
 - <https://data.seattle.gov/Transportation/Traffic-Signals/dr6d-ejex>
- Pavement edges
 - <https://data.seattle.gov/dataset/Pavement-Edge/zbph-53dz>
- Parks
 - <https://data.seattle.gov/dataset/City-Of-Seattle-Parks/kxj9-se6t>
- Trees
 - <https://data.seattle.gov/dataset/Trees/xg4t-j322>

II. EXPLANATION IN ACCURACY MEASUREMENTS AND FURTHER TESTS FOR *ACCURACY SCALABILITY RESULTS*

A. Accuracy Measurements

Correct localization: After voting for center location of the query image, the location of area with maximum vote is found. If the location of maximum vote area is close to the correct location, we consider this as a correct localization. Correct location is the center of the tile query tile and $\pm 1/5$ of the tile size around it.

B. Performance Evaluation and Scalability Results

In section V-C we performed further tests to show that the algorithm is nicely scalable. In separate tests we hashed 7,000, 10,000, 12,000, 15,000, ..., 250,000 buildings. It is important to note that each group of larger number of buildings covers all the previous buildings and adds some more (e.g. $7,000 \subset 10,000 \subset 20,000 \subset 30,000 \subset \dots \subset 250,000$). On each of these hash tables we performed queries of tiles from the initial area of 7,000 buildings.

III. COMPUTER SETUP

A. Computer Setup Used in Experiments in the Tests

Apple Mac Book Pro 15-inch Early 2011 (MacBookPro8,2)

- Intel Core i7 I7-2720QM Quad core processor with Hyper-threading @ 2.2 GHz max Turbo Frequency 3.3 GHz
- 16.0 GB DDR3 RAM @ 1600 MHz
- OCZ-VERTEX4 256GB SSD
- Windows 7 Ultimate 64-bit SP1 - Build 7601