Finding Building Footprints in Over-detailed Topographic Maps

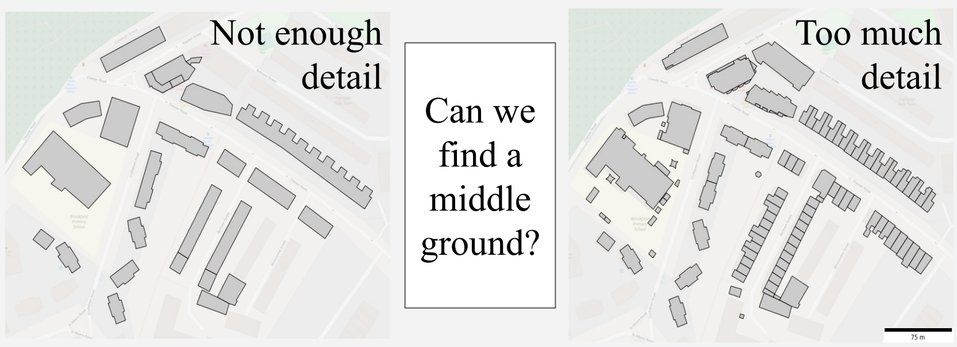
Robin Roussel, Ali Asadipour, and Sam Jacoby

Royal College of Art, Computer Science Research Centre + School of Architecture

Royal College of Art

Motivation

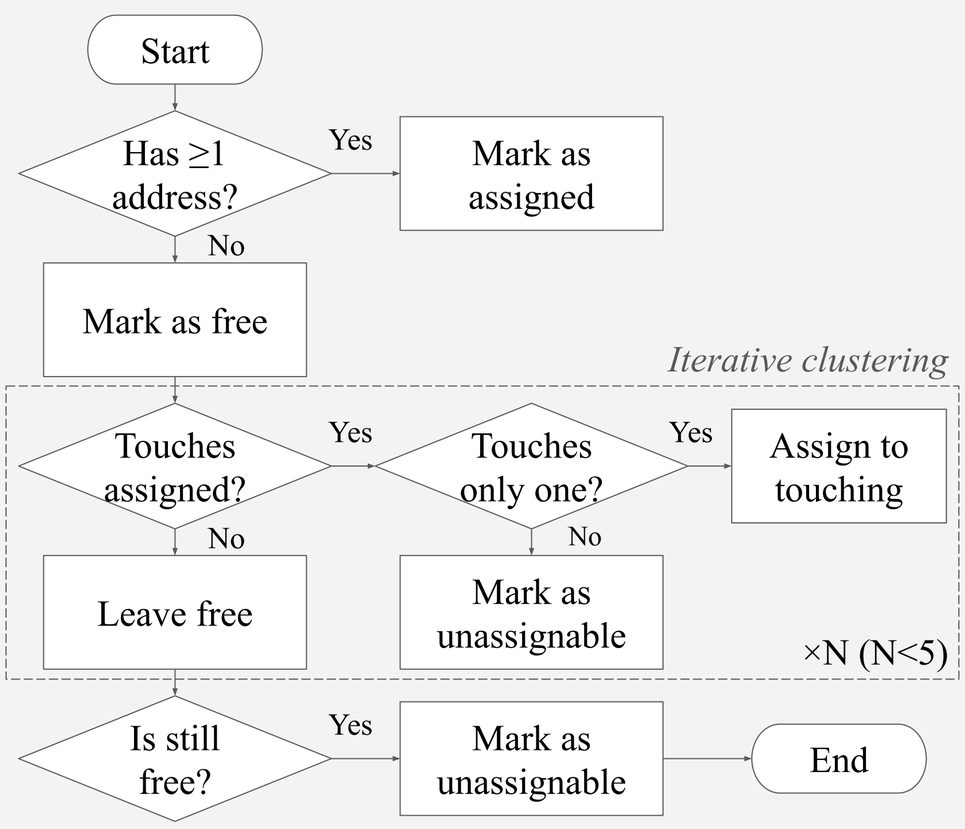
Building footprints are a key component of many GIS applications, including morphological and street view based analysis. Crowdsourced data such as OpenStreetMap (OSM) is widespread but not consistently detailed enough to reliably extract footprints of individual buildings, while topographic building maps such as the Ordnance Survey MasterMap Topography Layer (MTL) may split footprints into multiple polygons or include constructions without an address. Our goal is to determine which topographic building polygons can be unambiguously matched to individual footprints of buildings with an address, to enable integration with address-based data sources such as transactions or energy performance certificates.



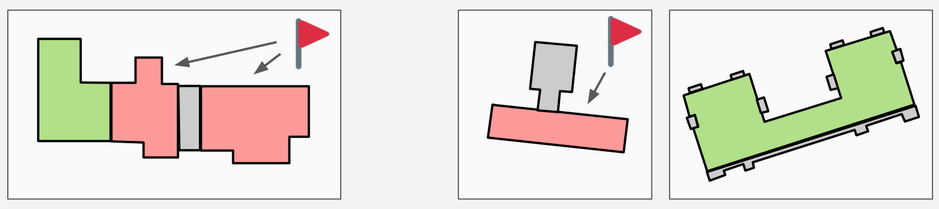
OpenStreetMap — Ordnance Survey MTL

Method

Phase 1: Find assignable building polygons



Phase 2: Flag ambiguous building polygons



Touches an unassignable polygon?

Touches a polygon without address of significant width and area?

Results

The method is evaluated on a subset of the MTL sampled in various areas of London to cover a wide range of typologies and built periods. Using this map together with Google Maps and Street View, MTL polygons were manually identified (or grouped and identified) as footprints of buildings with an address, or discarded.

The maps above show an example of input and output of our method. The left street view shows peripheral polygons correctly identified as dependencies of a core building polygon, while the right view shows the case of a building polygon that cannot be disambiguated without additional data (e.g. visual). The table below shows the proportion of raw OSM polygons and processed MTL polygons corresponding to the manually identified building footprints. The variability of the results comes from different dominant typologies in each area, and OSM's inconsistent level of detail.

LSOA	Buildings	Raw OSM	Processed MTL
Camden 001B	204	0.43	**0.79**
City of London 001A	67	**0.78**	0.49
Greenwich 004C	262	0.10	**0.84**
Hackney 006A	316	0.29	**0.91**
Islington 009B	107	0.36	**0.70**
Lambeth 035C	463	0.01	**0.97**
Newham 035D	534	0.76	**0.84**
Tower Hamlets 018A	179	**0.98**	0.93
Westminster 006B	104	0.65	**0.90**
Average		0.48	**0.82**

Conclusion

We described a method to determine which topographic building polygons can be unambiguously matched to footprints of buildings with an address. The results suggest that this method recovers significantly more building footprints than what can be obtained from a crowdsourced street map. Future research should expand the evaluation to other geographic areas, as well as investigate additional criteria and data sources to further reduce the number of ambiguous building polygons.

References

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Ordnance Survey (2023). OS MasterMap Topography Layer – Overview (v3.1), pp.14-15.

Acknowledgements

This work was supported by the Prosit Philosophiae Foundation. OS data © Crown copyright, obtained via Digimap. Background maps © OpenStreetMap contributors. Street views © Google.