

A Framework for Reconstructing Street Name and Geometry Changes Over Time: The Case of Liberec

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Abstract:

This contribution presents a framework for reconstructing changes in street names and geometries over time using the case of Liberec; it builds on the Liberec Street Gazetteer project, which traces transformations of the city's street structure. The starting point is the finding that existing historical street gazetteers primarily work with nomenclature, while geometry is usually reduced to its present-day form (Prague Street Gazetteer, 2026; Liberec Map Portal, 2026; Jablonec Map Portal, 2026); only exceptionally are historical names linked to their contemporaneous routes (Lviv Streets, 2026). As a result, there is no consistent approach to determining across time whether different names and routes still refer to the same street or to a different entity. Over time, a street behaves as a dynamic object: it may change its route (and thus its length), it may be renamed, it may split into multiple streets, or conversely be formed by the merging of earlier streets. These changes often do not occur synchronously.

The proposed data and methodological framework, grounded in source evidence, demonstrates how to record transformations of the street network over time using historical maps, street gazetteers, and administrative documents. The core is a relational spatial database that separates the street entity (a unit of record across sources) from its geometric representations and names. Temporal information is stored in the relationships between the entity and its representations (street–geometry, street–name), not in the objects themselves. This model allows capturing rerouting without a name change, renaming without a change in route, as well as reassignment of partial segments between entities without the need to automatically create new entities. Structural changes such as splits and merges are recorded genealogically to distinguish changes in representation from changes in identity based on expert interpretation (Peuquet, 1999).

A key principle is treating time as evidenced existence: intervals represent the earliest and latest provable occurrence derived from a specific source, rather than an estimate of the actual origin or disappearance. Reconstruction proceeds retrospectively from the current reference street network into the past (cf. Uhl et al., 2022); in each step, intervals are refined based on available evidence, and alternative geometries are added where justified. The interpretation of historical maps follows a conservative approach: it respects uncertainty and limitations of cartography, including generalization and selective depiction (Kaim et al., 2014), and does not introduce artificial connectors to enforce topological continuity without source support. Documented fragments are therefore treated as a legitimate outcome that explicitly reflects the limits of source evidence. Data integrity is supported by database constraints that prevent conflicting interval overlaps and maintain links to recorded sources.

The proposed approach enables the consistent creation of temporal snapshots, comparison of periods, and analysis of continuity and variability in the street structure while preserving source transparency. The case of Liberec further demonstrates that even an apparently ordinary urban network requires a strict separation of entity, geometry, and name in historical interpretation, particularly in contexts of administrative changes and renaming.

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