

Geovisualization of Mobility Patterns using Multisource Data: A Case Study at Envelopa Campus, Olomouc, Czechia

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Abstract:

The study addresses the challenge of deriving a coherent understanding of multimodal mobility patterns within the Palacký University Envelopa Campus, Olomouc, Czechia (Area of Interest – AOI) through the integration of heterogeneous mobility datasets with differing spatial and temporal resolutions. While high-resolution mobility data are increasingly available, their fragmented nature limits the analysis of interactions between transport modes across space and time.

A data integration framework is implemented, combining sensor-based traffic counts (Telraam), data from the Olomouc municipal sensor network (EnCLOD project), anonymised bike-sharing records (Nextbike), and meteorological data from Copernicus. The workflow incorporates harmonisation, temporal alignment, spatial aggregation, and overlay analysis to enable cross-dataset comparability. The analysis spans a period of over six months, capturing intra-day, weekly, and seasonal variability in mobility dynamics.

Spatial and temporal analyses are conducted to identify mobility hotspots, modal distributions, and temporal patterns, as well as to assess correlations between mobility intensity and weather conditions. Results are disseminated through interactive and static geovisualisations within a web-based mapping application, supporting exploratory analysis and interpretation. The proposed framework is intended to support city planning practitioners in making more informed, data-driven decisions that promote sustainable and efficient transport infrastructure.

The study further evaluates the methodological limitations associated with multisource data integration, including inconsistencies in spatial coverage, temporal granularity, and data quality. The findings highlight both the potential and constraints of combining heterogeneous mobility datasets and provide recommendations for robust overlay and integration practices. This work contributes a transferable framework for multimodal mobility analysis and supports data-informed decision-making in urban and campus-scale planning contexts.

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