Developing Flexible and Interoperable Multimodal Urban Models and Tools for Integration of Urban and Public Transport Planning

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Abstract. Well-managed cities that prioritize the seamless integration of the built environment with the mobility of people and goods by all modes of transport can significantly contribute to the sustainability of both mobility and the urban environment. However, achieving this level of integration poses a significant challenge due to the absence of robust workflows spanning from the early strategic stages to the later detailed stages of planning, which hinders effective communication and collaboration among actors involved in the planning process. Current models and tools often concentrate on specific aspects of analysis, with unique inputs and outputs. Some exhibit excessive detail and data requirements, thereby diminishing their suitability for strategic planning, whereas others are excessively simplified, constraining their utility during detailed planning. As a result, their lack of flexibility and interoperability fail to adequately support a sustainable planning process.

To address this gap, this research project aims to create a suite of interoperable multimodal urban network models and tools that represent both individual (e.g. walking, cycling, and driving) and collective transport networks (i.e. public transportation) at various levels of detail, enabling a comprehensive integrated workflow. The models, here demonstrated for the Västra Götaland Region in Sweden, were built using Python. They integrate individual transport network data from OpenStreetMap (OSM) with the collective transport network models that are created by aggregating General Transit Feed Specification (GTFS) data at different levels of detail. The results encompass seven interoperable network models, characterized by varying methods of aggregation, ranging from a time-based approach, which yields a frequency-based model, useful for addressing the requirements of detailed planning stages; to a geographical approach, resulting in simpler topological models that are more suitable for calculating centrality measures, useful for macro and strategic planning purposes.

In the subsequent phases, the network models will be matched with the specific requirements of the local actors engaged in the urban and transport planning process at different stages. The goal is to support different tools (existing and new) and facilitate a seamless workflow, fostering effective collaboration between transport planning and urban planning practitioners across all stages of the planning process.