Master Thesis

Simplified Model of German Railway Network Topologies for Microscopic Simulation

In this research study the main characteristics influencing the capacity for the long and short distance passenger network as well as for the freight network in Germany were identified in order to define simplified network configuration. These characteristics can be classified into three categories which are infrastructure, timetables and rolling stock characteristics.

Foto: Sebastian Arce

The most relevant infrastructure characteristics are speed, number of tracks, distance between stations, gradient, type of train protection system, signaling as well as the layout of both stations and tracks. For timetables, the most relevant parameters are the operating time, the interval between trains, the total travel time and the travel time between stations. The most significant parameters for rolling characteristics are train length, weight, maximum speed and acceleration.

The first step was to obtain information from different open data portal networks. The data for infrastructure, timetables and rolling characteristics were obtained from the Deutsche Bahn and OSM portals, GFTS portals and train supplier websites respectively. Then, the information was imported into QGIS in order to process and analyze the data for subsequent export as CSV files. Finally, these files were imported into Excel to convert them into XML files readable by Railsys.

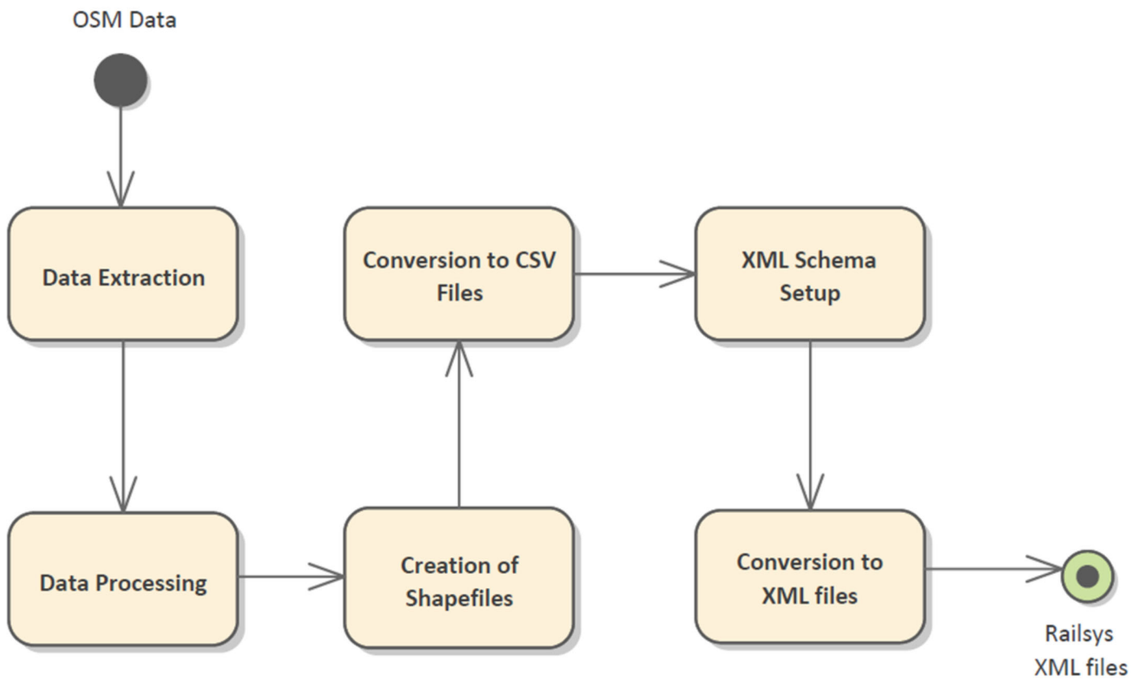

Figure 1. Research Methodology

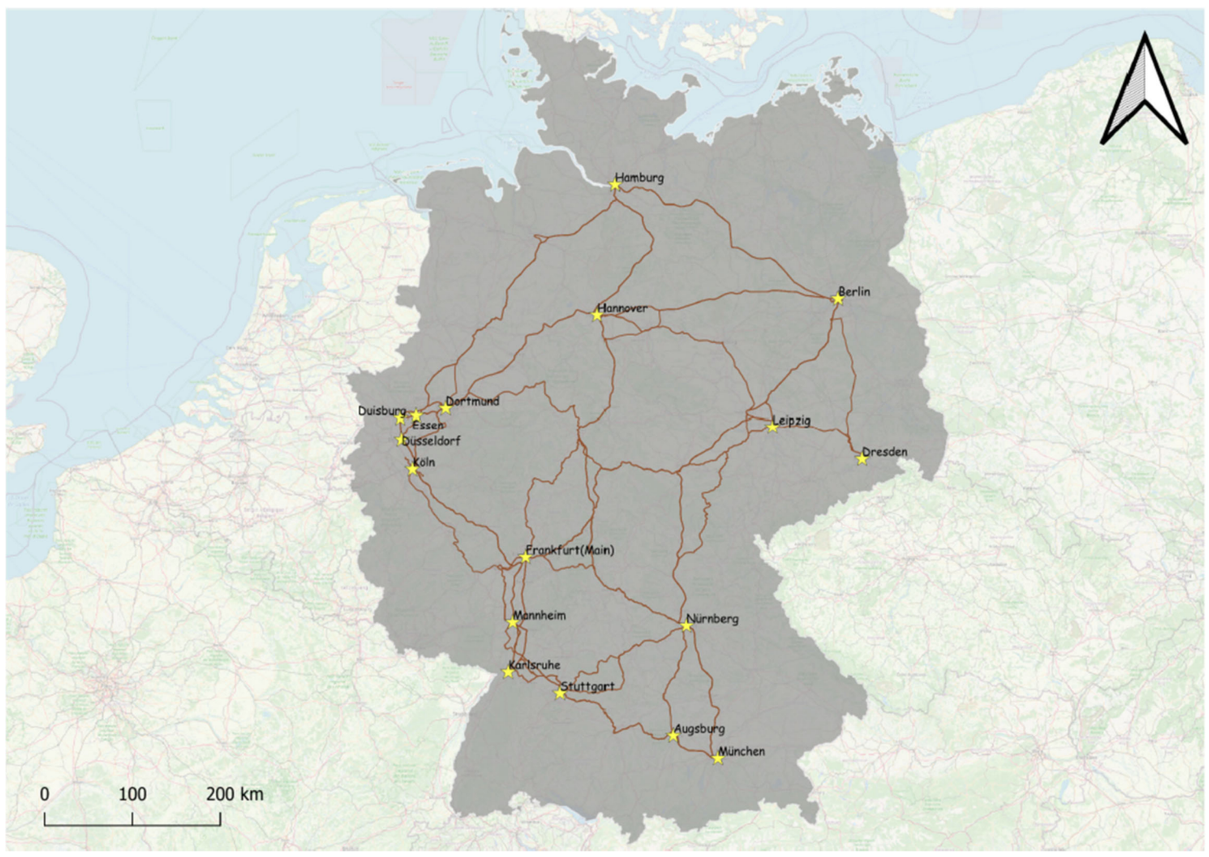

Figure 2. Simplified Model of the Railway Network in Germany

The main contribution of this research is the development of a methodology that simplifies the procedure of modeling train networks to perform microscopic analysis. One of the advantages of using OSM data is that its level of detail is at microscopic level. The infrastructure has a high level of detail where it is possible to identify all the elements of the railway network such as the exact position of signals, stops as well as a high level of detail of the layout of both tracks and stations. This allows to reduce the modeling time due to the fact that the infrastructure does not have to be modeled manually.

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