

Time cartogram series to explore differences in the level of railway services: a case of the Overijssel railways

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Large collections of temporal data are available these days. Temporal data are often related to movement. This could be along fixed networks such as rail or road networks or free movement by animals or birds. Suitable visual representations need to be designed in order to analyze and synthesize these data to produce useful insights about phenomena and systems represented by the data.

An alternative approach is the use of a cartogram. In a cartogram, the map elements (i.e., areas, lines and points) are intentionally modified with respect to an attribute such as election result, population or travelling-time. A time cartogram is a type of cartogram in which the geographic-distance between locations is replaced by a time-related attribute (e.g., travelling-time) and the geography is distorted accordingly.

Time cartograms can show the differences in the level of railway services between regions or cities in a network. Consider Figure 1. Figure 1a shows a geographic map of the railways network of the Dutch province of Overijssel and Figure 1b compares three time cartograms while travelling from the city of Enschede. All are based on shortest-path distances using different ingredients from the time-table: intercity trains (stop only at major stations along the route) and stop trains (stop at all stations along the route) with and without transfer time. Besides showing the differences in the level of services, these cartograms reveal an interesting pattern. One can see that travelling by stop trains to the northwest part of the Overijssel takes shorter despite stopping at all stations along the route.

In this research, we develop an interactive timeline based representation of time cartogram series constructed for the city of Enschede at different times. The changes in the shapes of these time-series cartograms can show how the accessibility of various cities varies over time. The comparison between these cartograms can reveal some interesting temporal patterns that may not be visible using other representations. The results will be presented during the conference.

Keywords: temporal data, time cartogram, Overijssel railways

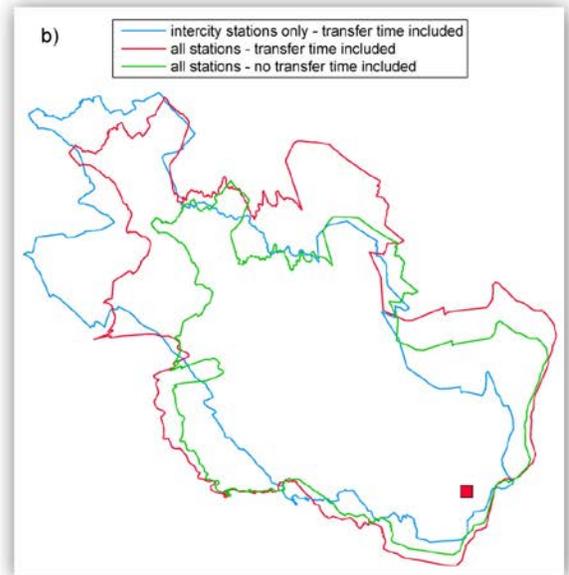
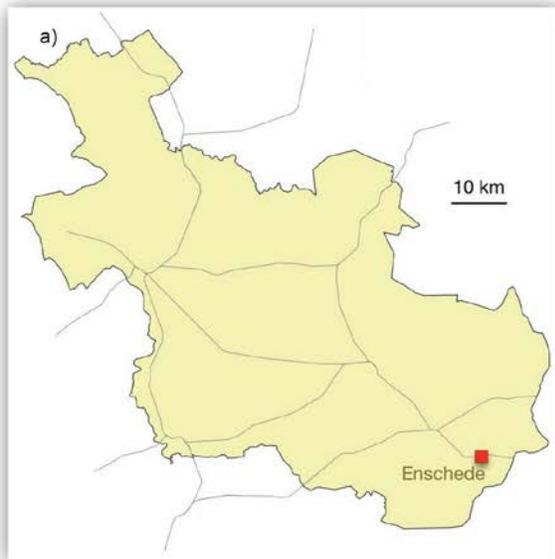


Figure 1. Cartograms and time: *a)* a geographic map of the Overijssel's railways; *b)* an overlay of three cartograms from the city of Enschede: *i)* travelling from Enschede by intercity train, including transfer time (blue); *ii)* travelling from Enschede by stop train, including transfer time (red); *iii)* travelling from Enschede by stop train, not including transfer time (green).