Complexity of routes in multi-modal wayfinding

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Extended Abstract

Imagine yourself in the following situation: you are new to the area, you need to find the best route to your destination, and you have decided to use the public transportation system. How can you determine the best route to your destination?

Research on choosing routes within networks has concentrated on shortest path problems and derivatives, such as fastest or cheapest path. However, the best route can be any of the following list:

- most scenic,
- least complicated to remember,
- easiest to navigate,
- best suited to a disability,
- best for the time of day (night, rush hour), etc.

Those are representatives of three different types of ‘best’: the first group (scenic, complicated, easiest) relies on environmental attributes, i.e. physical characteristics of the
route. The second group (disability) is based on characteristics of the traveler, and the third group (time of day) on temporal characteristics.

We derive measures of complexity to describe the physical characteristics of nodes, links, and routes. By measure of complexity, we mean a measure of how difficult a route will be for a traveler. We use an information processing approach to determine the complexity of nodes, links, and routes of the public transportation system, i.e. we look at the information provided in the environment. In addition, we present the results of the user survey to validate our measures. This research contributes to the open problem of determining the information needs of wayfinding (Gluck 1991).

Our wayfinding problem is set within the environment of the public transportation system in Zurich. We make a distinction between the typical network view of a transportation system and the more detailed route view a traveler needs (Timpf 2002). More concrete, the traveler has a three-dimensional metric view of the places and links on the route, whereas the network view is one-dimensional and topological.

Our aim is to assign a complexity measure to a specific route in order to compare this route to other routes while selecting the “best” route. We propose and discuss several measures for the complexity of nodes and the complexity of links. We make a distinction between the complexity of a node (link) and the complexity of this node (link) for a particular route. This distinction results in a distinction between the complexity of a path within the network and the complexity of a route.

We build on qualitative research of Gaerling (1986), who proposed a system for classifying environments to predict the extent of wayfinding problems. According to Gaerling, three facets of the environment are important for successful wayfinding:

- degree of (architectural) differentiation,
• degree of visual access, and

• complexity of spatial layout.

We concentrate on the complexity of spatial layout and the degree of visual access within the transfer nodes. The guiding idea is that nodes and links should be legible to the traveler (Lynch, 1960). In our measure, we take into account those physical structures that are known to have an impact on human wayfinding and orientation abilities (Gaerling, 1980).

Our model can be used as the basis for a wayfinding model that derives good wayfinding directions (Lovelace 1999) to provide an automated assistance for travelers (location-based service) in the city of Zurich. In addition, it can be used to evaluate the public transportation network as a whole, and to evaluate specific places within that network in particular to improve legibility and ease of wayfinding.

Results of the validation by user surveys will be available by the time of the conference.

References


