Personalized Routing for Car Navigation Systems

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Abstract.

From a personalized computing standpoint, current in-car routing systems are somewhat primitive. Usually routing options are dependent on the fastest (usually default) or the shortest route from a start point to an end point. Start and end points are matched to an address or another point of interest (POI) via geocoding functions.

Currently attempts are made to consider other parameters. For example BMWi started to consider energy consumption for electric vehicles that limit the driving range. Depending on the setting of the cars systems the range may vary. Additionally specific routes may use more energy than others. Special routing functionalities are considered for example for the transportation of nuclear waste to find the safest route. These are special cases and the route is selected on a case by case basis. Additionally data streams, such as near-real-time traffic information are considered for in-car routing systems. The “data quality of this information” is seen as a “product” and to some extent users are willing to pay extra for high quality traffic information that is used in the computation of an optimal route. This optimal route is the fastest route depending on the near-real time traffic situation.

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Generally the consideration of these parameters is technology driven. The user may not even notice a change in the route; he or she would like to arrive in the scheduled time that is given by the routing system. The complexity of way-finding tasks has been investigated by a number of researchers. In user centered research, Heye and Timpf (2003) investigated the complexity of routing decisions in a broader framework including public transportation. They determine complexity measures for physical complexity of routes, which can be calculated based on information about the environment at transfer points and on the network structure.

We suggest to provide specific users (or user groups) with an in-car routing system that can offer a personalized route. With an increase of available dynamic data streams (weather, traffic etc.) and growing computing functionalities on mobile devices, the parameters for routing functionalities need to be extended. Therefore we aim on more personalized routing included in car navigation systems that have functionalities depending on the users' interests and abilities. A number of different parameters that could be considered may provide the user with a shortest, fastest, safest, most beautiful, least fuel / energy consumption, male/female (Häusler et al., 2010), easiest (to drive) (Krisp et al., 2014) or most difficult (to drive) route. Various road features need to be examined and ranked. Knowledge of road data is a basic prerequisite, especially the attribute features that are created in databases. The functionalities need to consider the available data and the computational algorithms. Duckham and Kulik (2003) investigated "the simplest route" in terms of how easy it is to explain, understand, memorize or execute the navigation instructions for the route. Most automated navigation systems rely on computing the solution for the shortest path problem, and not the problem of finding the "simplest" path (Duckham and Kulik, 2003). Technically this way of computing a personalized route can assist users to drive a perhaps more "reasonable" or more "natural" route. First implementation attempts to provide the user with an "easy to drive route" have been successful. They route the users around "complicated crossings", which are defined as obstacles (Krisp et al., 2014). Still challenges remain within the area of user modeling or user profiling.

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