Route Selection Based On Safety Parameters

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ABSTRACT

Digital maps provided via websites, mobile apps, in-car navigation systems, etc. include features to provide route guidance. Currently, such maps compute routes based on parameters such as travel time, cost, transport mode, type of roadway, etc. This disclosure describes techniques to automatically assign a safety rating to routes based on historical data related to each route. For example, such data can include accident data for road segments along the route, data regarding injuries suffered in such accidents, etc. The safety rating can be displayed to users and can be utilized in route selection.

KEYWORDS

- Digital map
- Navigation
- Routing
- Route safety

BACKGROUND

An important and frequent use case for digital maps, e.g., available via websites, as mobile apps, or as part of an on-board navigation system of a vehicle is to provide routing to particular destinations. Route options provided by such digital maps take into account available relevant information such as start and end locations, distance, travel time, transportation mode, cost, etc. Users can compare the provided options along one or more of these parameters and choose the route per their preference. For example, users who prioritize time constraints may choose a route that minimizes travel time but has toll roads. In another example, tourists may choose scenic routes over fastest routes.
An important aspect of route selection relates to safety. For example, certain routes, e.g., with sharp turns, poor road design, etc. may be associated with lower safety due to a higher likelihood of accidents or collisions. Currently, digital maps lack the functionality to take safety factors into account when selecting, displaying, and comparing various routes between an origin and a destination.

**DESCRIPTION**

This disclosure describes techniques that enable digital map applications to provide routing information that take into account available information related to route safety. For example, such information can include available historical information related to events that took place on the route that led to harm, the severity of harm, road conditions, traffic patterns, etc. Such information may be obtained from public sources such as traffic data, accident data, and/or other sources accessed with permission.

Upon determination of routes between an origin and a destination, an estimated safety rating for each route is determined. The safety rating is provided to users to enable them to compare and select a route taking into account safety information. The safety rating can be calculated by combining probability of harm and severity of harm, based on historical data associated with the route. For instance, probability of harm can be calculated based on reported accidents and injuries along a route or various segments within the route. Similarly, severity of harm can be estimated based on the distribution of reported injuries between minor, severe, and fatal. The accident and injury data accessed is publicly available data, and can optionally include other data sources that include user-permitted data related to such factors.
The probability and severity are combined such that the resulting safety score represents a balance between the two aspects. For example, consider the following three potential routes between a given origin and destination pair:

- **Route 1**: Requires entering a freeway using an on-ramp where a number of accidents occurred within the past year, including fatalities.
- **Route 2**: Involves passing through an intersection where several collisions have occurred within the past year, resulting in minor injuries.
- **Route 3**: Goes through a neighborhood with high levels of pedestrian traffic with increased likelihood of injuries for pedestrians who get in the path of an oncoming vehicle.

The safety score for each route can combine the different risk and severity of historical events along each route, thus enabling a comparison based on safety. If the routes are similar in terms of other parameters, such as distance, time of travel, etc., the route with the best safety rating can be shown as a potential recommended route. For instance, in the above example, Route 2 can be selected as the one with the best safety rating since it has no major incidents such as fatal injuries despite having some probability of minor injury.
Fig. 1: Choosing a route between an origin and destination based on safety parameters

Fig. 1 shows an example of operational implementation of the techniques described in this disclosure. A user uses a digital map application (104) on a device (102) to seek routes (122) to go from an origin A (118) to a destination B (120). Along with map and traffic data (112), travel safety data (114) and user-specified safety requirements (116) are taken into account by the map application to determine available routes and calculate safety ratings.

For instance, Fig. 1 shows three possible routes between A and B, with Route 2 being highlighted based on safety information (124). The other two routes (i.e., Routes 1 and 2) are grayed out in the list and the map to indicate that these are lower in safety ratings compared to Route 2. The user interface of the digital map can show different routes along with associated...
safety ratings, along with factors such as distance, time of travel, etc. Upon user request, additional safety information related to the route, e.g., historical information, can be provided to the user. The techniques described herein can be implemented within any digital map platform or application that provides navigation assistance.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (e.g., information about a user’s preferences, or a user’s current location), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user’s identity may be treated so that no personally identifiable information can be determined for the user, or a user’s geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

Digital maps provided via websites, mobile apps, in-car navigation systems, etc. include features to provide route guidance. Currently, such maps compute routes based on parameters such as travel time, cost, transport mode, type of roadway, etc. This disclosure describes techniques to automatically assign a safety rating to routes based on historical data related to each route. For example, such data can include accident data for road segments along the route, data regarding injuries suffered in such accidents, etc. The safety rating can be displayed to users and can be utilized in route selection.