Development of WALTER: A Route Planning System that Analyzes Accident Data to Determine Fast, Simple, and Safe Driving Routes

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Car accidents cause injury, death, and economic damage. As some roads are inherently safer than others due to structural differences, accident risk can be reduced by deliberately planning routes to avoid high-risk areas. Existing route planning systems either neglect route safety, drastically sacrifice route speed/simplicity, or use an abstract measure to determine safety. We developed a system (in JavaScript using ArcGIS) that uses an empirical statistic to determine safer routes while maintaining the routes' speed and simplicity. Our prototype works in Saint Paul, Minnesota. Accident data from the Saint Paul Police Department allowed for the creation of this system (named WALTER). To generate potentially safer—yet still fast/simple—routes, alternate routes avoid one high-volume accident cluster (determined via k-means clustering in R) at a time. Then, route options are ranked on safety via determination of risk scores equal to the estimated number of accidents per route traversal. An interactive map GUI allows users to access WALTER, browse potential routes, view/print directions, and export their chosen route to a real-time navigation application. When tested, WALTER found a safer alternative to the fastest route 52.9% of the time; otherwise, the fastest route was the safest. Safe routes on average had 27.8% lower risk yet only 14.2% higher drive time and 1.61 more turns. Due to high usability and mitigated route inconvenience, WALTER is both accessible and practical for the average Saint Paul driver. Furthermore, WALTER is easily implemented in any city with accident data, allowing for improved road safety across the developed world.