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A behaviourally realistic description of the route choice process should consider variables that are both observable, such as travel time and cost, and unobservable, such as attitudes, perceptions, spatial abilities and network knowledge. This manuscript focuses on automotive route choice behaviour by proposing a methodology for collecting and analyzing behavioural indicators and modelling route choices of individuals driving habitually from home to their workplace. A web-based survey was designed to collect attitudinal data and observed route choices among faculty and staff members of Turin Polytechnic. A reliable dataset was prepared through measures of internal consistency and sampling adequacy, and data were analyzed with a proper application of factor analysis to the route choice context. For the dataset obtained from the survey, six latent constructs affecting driver behaviour were extracted and scores on each factor for each survey participant were calculated. Path generation algorithms were examined with respect to observed behaviour, through a measure of reproduction with deterministic techniques of the routes indicated in the answers to the survey. Results presented evidence that the majority of drivers did not minimize travel time and distance, while simulation techniques were suitable to produce realistic alternative paths in the choice set generation phase. Several route choice models were evaluated: Multinomial Logit, C-Logit, Path Size Logit, Generalized Nested Logit, Cross Nested Logit and Link Nested Logit. Estimates were produced from model specifications that considered level-of-service, label and facility dummy variables. Moreover, a modelling framework was designed to represent drivers’ choices as affected by the latent constructs extracted with factor analysis. Previous experience resulted the main element affecting route choice. From a theoretical and empirical perspective, various model structures were compared. It was accomplished the estimation of the Generalized Nested Logit and the Link Nested Logit models for a large network and it was demonstrated that the C-Logit and the Cross Nested Logit models positively performed according to theory thanks to the choice of suitable model parameter specifications. The Path Size Logit model appeared the structure with the best ratio between goodness-of-fit and computational costs, even though exponential formulation of the utility correction term deserves further investigation. Results suggest that the development of instruments to assess individual traits and the refinement of error structures within choice model formulations would allow estimation of choice models characterized by improved explanatory power.

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