Travel demand generation using Bayesian Networks: an application to Switzerland

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Abstract

Agent-based models have gained popularity over the last years as they allow simulating the travel behavior at the individual scale. They are thus of great interest to assess the impacts of transportation policy measures. However, to ensure reliable results, those models are data-intensive, with regards to transport supply and demand. In particular, a detailed description of the population and its travel behavior is required.
Bayesian Networks (BNs) are directed acyclic graphs representing joint probability distributions. They have recently been employed for population synthesis (Sun and Erath, 2015) and daily activity patterns generation (Joubert and De Waal, 2020). These studies show that BNs effectively capture the causality links existing between variables and are easily interpretable. Moreover, given their flexible structure, BNs can be adapted for situations in which data from various sources is combined.
In this study, our goal is to estimate a BN for both population and activity pattern synthesis in Switzerland. Data about the socio-demographic condition is obtained from a comprehensive survey (STATPOP[1]), while a smaller scale travel survey (MZMV[2]) provides information about daily activity patterns. We evaluate the performance of this approach compared to the statistical matching algorithm (D'Orazio *et al.*, 2006), which is a contribution towards the development of interpretable, flexible and behaviorally rich travel demand generation models.

1 References

D'Orazio, M., M. Di Zio and M. Scanu (2006) *Statistical matching: Theory and practice*, John Wiley & Sons.

Joubert, J. W. and A. De Waal (2020) Activity-based travel demand generation using bayesian networks, *Transportation Research Part C: Emerging Technologies*, **120**, 102804.

Sun, L. and A. Erath (2015) A bayesian network approach for population synthesis, *Transportation Research Part C: Emerging Technologies*, **61**, 49–62.

[1]https://www.bfs.admin.ch/bfs/en/home/statistics/population/surveys/statpop.html
[2]https://www.bfs.admin.ch/bfs/de/home/statistiken/mobilitaet-verkehr/erhebungen/mzmv.html