

Draft abstract for article intended for submission to Transportation Research Part B: Methodological

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Title

Developing Contemporary UK Traffic Simulation Models at the Resolution of Individual People and Vehicles

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Abstract

This article addresses the computational challenge in developing a dynamic geographical map of people movements at the resolution of individuals and vehicles at a precision of metres and seconds for the contemporary UK. The 2001 UK Population Census estimated the human population of the UK at 58.8 million [1]. The land area of the UK as aggregated from Local Authority District data is in the order of 24.2 million hectares [2]. The average distance travelled per person (based on a sample of 38,897 individuals) in Great Britain in 2008 was recorded as 6,848 miles (just over 11 million metres). For the sample, almost 50% of the distance travelled on average per person were driven in a car or van and nearly 30% of the distance travelled on average per person were as a passenger in a car or van. At the end of 2009, there were 34.3 million road vehicles registered in Great Britain with the Driver and Vehicle Licensing Agency (DVLA) [3].

A simple model is to represent each person and each vehicle as a point in space detailed to an arbitrary, but high (sub metre) precision. In order to have a dynamic map that provides a useful representation several things are needed. Firstly, a system is needed that can handle such a set of points and keep track of changes in location over time (arguably it also needs to produce useful visualisations and statistics that generalise distributions and movements). Secondly, to make the locational positioning realistic, some data about the location of individuals and vehicles is needed to initialise (seed) the simulation. Thirdly a model which initiates peoples movements from initial seed locations is needed and this model should be physically constrained imposing realistic limits on how close the points can pack together. This article focuses on the computational challenge and attempts to scope out what is needed to run simulations based on a simplified form of such a model. The author hopes that more readers are more excited by the potential uses of such a model than there are readers more in fear of the potential misuse of such a model.

The models developed by the author have been conceived to detail movements in what may be regarded as public space and not be too concerned with detailing movements in more private space, however conceptually this is problematic and issues arise with the geographical definition of public and private space.

People in the UK do not necessarily all travel at the same time and they don't all move in the same way and their journeys are for myriad different purposes. There are more common times and modes

of transport and purposes for which people move and data about these are available via the National Travel Survey [3]. Although a great deal of activity tends to occur in hours of daylight, some people are more active and move around in twilight and during the night. People move individually, move in groups and use different modes of transport, in different types of vehicle and use both scheduled public services, more ad hoc taxi like services and social networks ranging from the basic hitch hike on the spot to more organised technologically advanced lift sharing schemes using mobile communications devices. This article presents progress on the development of models that capture some of this detail and routes individuals along public transport infrastructure. This work is currently resourced via the UK Economic and Social Research Council through the National Centre for e-Social Science research node program in the GENESIS project[4].

References

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