A Problem of scale in modeling transport networks

In transport modelling, *aggregation* refers to the level of detail included in network and behavioural models, and the methods used to summarise characteristics of detailed models for larger scale analyses.

For modelling traffic flow dynamics on a single road link, there is some theory for the aggregation of individual car-following models to give fluid flow PDEs [1] and area speed-flow relationships [2]. For transport networks there is no such theory of aggregation. While various network models exist for different scales of analysis, those currently in use were developed piecemeal, and remain practically and theoretically disconnected.

Governments require models to make policy decisions and to justify transport infrastructure changes; the UK Department for Transport requires cost benefit analysis for major schemes to extend 60 years into the future. The role of transport in the context of climate change requires analysis over similarly long time scales. To provide advice on such matters, based on more solid foundations, transport networks models on these spatial and temporal scales should be consistent with those commonly used for smaller scale, nearer term forecasting.

The challenge then, is to aggregate the network infrastructure while maintaining a consistent representation of both traffic flows and the partition of space into “origin” and “destination” zones for travel. In this seminar I will explore these issues in the context of recent advances in network modelling, and discuss the considerable challenges that remain.


Further Reading:
Foundation text for transport network modelling