

Modelling Disruption in Large Scale Transit Systems

Michael Batty, CASA, University College London, UK

IFISC Seminar Room

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We are working with a very large data set of the volumes of entries and exits at tube stations by passengers using the London tube and overground rail networks. The data set is from the smart cards □ Oyster cards □ that travellers employ to travel on the system. The data is time stamped by the second at which the traveller enters or leaves the system and the set we are currently working with has about one billion records over about 6 months. There are around 4-5 million tap in and tap outs per day. What we are doing is essentially disrupting the networks □ closing stations, lines and so on- so that we can examine the diffusion of traffic and the build-up of congestion at stations when such closures take place. We have two models, first a model of the network that we simulate using graph theory and second a model of the same network on which flows are allocated. We are measuring the accessibility of stations using various notions of centrality and these indices change of course when disruptions occur. Our first analysis is based on betweenness centrality and the second on a flow measure of the same kind of centrality. We explore various case studies of how the disruptions affect the network, first in terms of the infrastructure and then in terms of flows. Our analysis is preliminary but suggestive of how we might explore this problem in greater detail, linking the analysis to diffusion across coupled networks.

Contact information:

Ingo Fischer

- ingo@ifisc.uib-csic.es

- 971 25 98 78

Llorenç Serra

- llorens.serra@uib.es

- 971 17 28 05



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