Multi-scale simulation of damaged transport systems: prospects and tasks of the development

*Takamasa Iryo[1]

1.Kobe University

This presentation proposes an outline of the multi-scale simulation of damaged transport systems and discusses its prospects and tasks of the development. Damages on buildings and infrastructure by a major disaster will influence both performances and demand patterns of transport systems in a damaged area. The combination of degraded performances and a demand pattern that is significantly different from a normal demand can cause severe congestion, creating a major impact on the social systems of a damaged area. The multi-scale simulation of damaged transport systems aims to reproduce such situations using a traffic flow simulator and a transport demand model for a disaster situation combined with an estimated physical damages on buildings and infrastructure. Two issues should be mentioned to develop the simulation system. First, in a major disaster, an affected area should be substantially large and hence the scale of the problem (i.e. the number of links of a network and agents moving in it) must be very large. Second, the demand pattern after a disaster should be completely different from that of normal days and cannot be precisely estimated beforehand, implying that a huge number of demand patterns needs to be evaluated in the simulation. These two issues certainly arise computation burden that is very huge compared to typical problems that have been dealt with in past transport studies. The high-performance computing is useful to overcome these issues. In this presentation, the following technical topics will be introduced with a few tentative result: (1) How a traffic flow simulator is to be parallelised, (2) How travellers' behaviour in a post-disaster network can be mathematically modelled, (3) How numerous patterns of the demands are to be sampled so that practically important cases are effectively evaluated.

Keywords: Traffic simulator

