Dynamic Modeling of Overload in Scale Free Networks

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We introduce a simple dynamic model to investigate the fragmentation of transport networks. The transport properties like as the size of largest connected cluster, the length of the minimum paths and the optimal paths between a pair of nodes of the network were evaluated upon continuously increasing the load on the system. We use two load insertion strategies: an uniform random distribution of loads and a Cohen-like immunization strategy (one node is selected with a uniform probability p and one of its first neighbours, randomly selected,

receives the load). Both strategies may be classified as local strategies but the resulting effects are qualitatively different. Evaluating the physical quantities as a function of time we observe that for the random distribution strategy there is a crossover from a fully connected cluster to a non-connected state in the sense that all links become unavailable. On the other hand, following the Cohen-like strategy we found a sudden change in transport

properties which is may be interpreted as a percolation-like transition induced by the cumulative process of load.

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