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INVESTIGATION INTO SURVIVABILITY OF THE SYSTEM OF CAR FLOWS AND TRAIN FORMATION ON THE BASE OF THE PERCOLATION THEORY

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The system of freight car flows and train formation on railways in Ukraine is based on accurate cargo delivery. One of the system features characterizing railway transport capability to function in predetermined conditions is the system survivability. The prevailing approaches to analyzing the transportation system survivability are imperfect as they do not allow examining the actual system's behaviour. Under such conditions investigation into the transportation system survivability requires new solutions based on up-to-date methods of analysis and computer simulation [1].

The proposed approach to analyzing survivability of the system of car flows and train formation is based on the described interrelations between railway stations within the network presented as a network structure of paths according to the freight train formation plan (TFP) with a directed graph the nodes of which correspond to arrival/departure train stations while its arcs are destinations. The network analysis is based on the information derived from "The order and direction of car flows in the organization of freight trains on Ukraine's railways for 2012-2013" [2]. To summarize the information, the database of railway stations in the network, the TFP destinations in accordance with types of trains (through, divisional, assorted trains), and their distances has been established. The analysis has been carried out with the free software PAJEK [3]. The analysis of 482 links between 181 railway stations is the object of the applied network research (fig.1).

Within the investigation into survivability of the network destination structure according to the train formation plan it has been offered to use the site percolation process [4] as an alternative for special displacement of

freight cars within the network under increased amount of stations which cannot perform their basic function regarding passing trains to their destinations in accordance with the train formation plan under disadvantageous conditions (emergencies, overload etc). The percolation process suggests considering the change in freight transportation distances within the network under increased amount of failures [5].

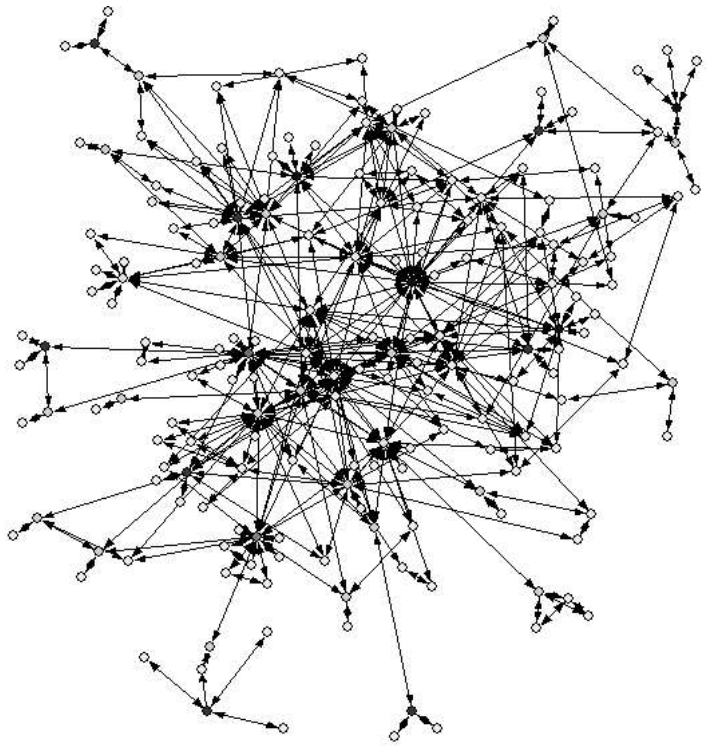

Fig. 1. Graph visualization of the TFP destination network

The research has proved stability of the destination network in accordance with the train formation plan to random failures, while the network graph is extremely vulnerable to coordinated attacks. To select the most stable structures within the train destination network the article gives calculation of the k-kernel of the highest graph component, which reaches the critical point during the random and correlated percolation.

The proposed approach to analyzing the transport system survivability allows monitoring the system's behaviour on its actual scale. The results obtained practically make it possible to identify the most significant network stations, effectiveness of which greatly influences the carrying capacity of the whole railway network.

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INTELLIGENT INFORMATION LOGISTICS MANAGEMENT SYSTEM PRODUCT LIFE CYCLE TECHNOGENIC TRANSPORT COMPANIES

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Analysis of the use of modern information technology in the pro-industry shows that one of the areas of development are increasingly Shih Roque application of information technologies at all stages of the life cycle of complex high-tech products as part of an integrated infor-mation environment.

Integrated computerized system developed eco-economic monitoring, modeling and management (SEEMU) nohennym-tech industrial enterprise, which is represented as a 3-level hierarchical structure, functioning in conditions of instability. This system is based on the same basic principles, concepts and the results of author [3-6].