Expected Value for Routable Disjoint Paths Given Random Terminal Selections

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The k-Disjoint Path Problem has been studied for a variety of graphs: determine k, the largest number which, for any starting vertices s_1,s_2,...,s_k and any corresponding ending vertices t_1,t_2,...,t_k in graph G, it can be guaranteed that vertex-disjoint paths can be routed, connecting the (s_i, t_i) pairs. The guarantee of k disjoint paths in a network guarantees faster communications by avoiding queuing. But often, more than k disjoint paths can be simultaneously routed, depending on the selection of the (s_i, t_i) pairs and properties of G. This paper introduces the concept of the pansophy of a graph G – the expected value for the number of disjoint paths which can be simultaneously routed in G given random selections of (s_i, t_i) pairs. The object is to create a mechanism for evaluating the efficiency of algorithms which aim to route communications within a network without queuing. Care is taken is defining terms and discussing how they relate to algorithmic performance. The pansophies of several simple graphs are then combinatorially computed as demonstrations.

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