Reconfiguration in Tournaments

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A tournament is a directed graph with exactly one edge joining each pair of vertices. A tournament is transitive if there is a numbering of the vertices from 1 to n so that every edge is directed from a lower-numbered vertex to a higher-numbered vertex. We consider reconfiguration of transitive subtournaments in a tournament T under token sliding, that is: Consider two transitive subtournaments T_1 and T_2 of T, each with k vertices. Put a token on each vertex of T_1. Is it possible to slide the tokens, one at a time, along a directed edge, to reach T_2, where after each slide, the vertices with tokens on them induce a transitive subtournament. We show how to do this for two classes of tournaments. We also show that under the token addition and removal model of reconfiguration, the problem is PSPACE-complete.