

In this thesis we study Trahtman's proof of Road coloring problem and related algorithm. For every strongly connected directed multigraph with outdegree d and period 1, there exists synchronizing coloring. Béal and Perrin prove that Trahtman's proof can be simply generalized for every period and k -synchronizing coloring. We show generalized proof too. Trahtman's proof is constructive and is based on finding coloring with nontrivial stable states. We prove if there is only one maximal tree in P_α then the coloring is with nontrivial stable states. Subgraph P_α contains all edges with same color. We show how to find such coloring. Then we describe algorithms for finding k -synchronizing coloring. First algorithm uses proposition from Trahtman's proof with time complexity $\mathcal{O}((n-k)dn^2)$. Then we show Trahtman's reduction and Béal and Perrin's algorithm based on Trahtman's proof but time complexity is $\mathcal{O}((n-k)dn)$ where n is the number of vertices.