Improved Approximations for Graph-TSP in Regular Graphs

R. Ravi, Carnegie Mellon University

A tour in a graph is a connected walk that visits every vertex at least once, and returns to the starting vertex. We give improved approximation results for a tour with the minimum number of edges in regular graphs.

For cubic bipartite graphs, we provide a polynomial-time (9/7)-approximation algorithm for minimum tours. For connected d-regular graph with n vertices, we provide a method that constructs a tour of length at most $(1 + O(d^{-1/2}))n$, improving the previous result of Vishnoi (2012) that demonstrated a tour of length at most $(1 + O((\log d)^{-1/2}))n$.

The former result uses the cubic bipartite graph structure to find a cycle cover with large average length. The latter finds a spanning tree with few odd-degree vertices and augments it to a tour. Finding such spanning trees to augment is related to the linear arboricity conjecture of Akiyama, Exoo and Harary (1981), or alternatively, to a conjecture of Magnant and Martin (2009) regarding the path cover number of regular graphs.

Joint work with Uriel Feige (Weizmann Institute), Jeremy Karp (CMU) and Mohit Singh (Microsoft Research).