

Enumerate All Routes on a Doughnut

Yasuko Matsui*, Tokai University, Shin-ichi Nakano, Gunma University

In this talk we consider a very restricted version of the drawing problem. Given a matching $M = (U \cup V, E)$ as a bipartite graph, two concentric circles, the cyclic ordering of the vertices in U and the cyclic ordering of the vertices in V , we wish to draw M with the minimum number of edge crossings so that the vertices in U are on the smaller circle with the given cyclic ordering and the vertices in V are on the larger circle with the given cyclic ordering. We call the problem the *doughnut routing problem*. We design an $O(n^3)$ time algorithm to solve the problem. The main idea of the algorithm is a reduction to a set of the minimum length generator sequence problems.

Moreover we propose an enumeration algorithm for optimal solutions of the doughnut routing problems by using Reverse-search algorithm. Our algorithm implicitly defines a tree structure for all optimal solutions then enumerates all optimal solutions based on the tree.

Keywords: enumeration algorithm, doughnut routing problem, minimum length generator sequence problem