Packing 1-plane Hamiltonian cycles in complete geometric graphs

ABSTRACT

Counting the number of Hamiltonian cycles that are contained in a geometric graph is #P-complete even if the graph is known to be planar [15]. A relaxation for problems in plane geometric graphs is to allow the geometric graphs to be 1-plane, that is, each of its edges is crossed at most once. We consider the following question: For any set P of n points in the plane, how many 1-plane Hamiltonian cycles can be packed into a complete geometric graph Kn? We investigate the problem by taking two different situations of P, namely, when P is in convex position, wheel configurations position. For points in general position we prove the lower bound of $k - 1$ where $n = 2k + h$ and $0 \leq h < 2k$. In all of the situations, we investigate the constructions of the graphs obtained.