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İSTANBUL DISCRETE MATHEMATICS MEETINGS

Some Graph Classes Related to Telecommunication Networks

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Abstract

Given a tree and a set $\mathcal{P}$ of non-trivial simple paths of it, $\textsc{Vpt}(\mathcal{P})$ is the VPT graph (i.e. the vertex intersection graph) of $\mathcal{P}$, and $\textsc{Ept}(\mathcal{P})$ is the EPT graph (i.e. the edge intersection graph) of $\mathcal{P}$. Main motivation to study these graphs comes from telecommunication networks and since 1980s they have been extensively studied in the literature. In this talk, we will cover complexity results of some important decision/optimization problems in VPT and EPT.

Given two (edge) intersecting paths in a graph, their *split nodes* is the set of nodes having degree at least 3 in their union. A pair of (edge) intersecting paths is termed *non-splitting* if they have no split nodes, in other words their union is either a path or a cycle. We recently defined a new graph class related to EPT graph, the edge intersection graph of non-splitting paths $\textsc{Eptn}(\mathcal{P})$, termed the $EPTN$ graph, as the graph having a vertex for each path in $\mathcal{P}$, and an edge between every pair of intersecting and non-splitting paths. A graph G is an $EPTN$ graph if there is a tree T and a set of paths $\mathcal{P}$ of T such that $G = \textsc{Eptn}(\mathcal{P})$, and we say that $\langle T, \mathcal{P} \rangle$ is a *representation* of G. These graphs are of interest in all-optical networks using wavelength division multiplexing (WDM) technology, in which paths of a graph have to be colored, such that the set of paths in each color are pairwise non-splitting. Although $\textsc{Eptn}(\mathcal{P})$ is a partial subgraph of $\textsc{Ept}(\mathcal{P})$ which is in turn a partial subgraph of $\textsc{Vpt}(\mathcal{P})$, $EPTN$ graphs apparently have a more complex structure than EPT graphs. In the talk, we also present some partial results related to $EPTN$ recognition problem.

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