Dissertation Defense

On Spanning Trees with few Branch Vertices

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Abstract: Hamiltonian paths, which are a special kind of spanning tree, have long been of interest in graph theory and are notoriously hard to compute. One notable feature of a Hamiltonian path is that all its vertices have degree two in the path. In a tree, we call vertices of degree at least three *branch vertices*. If a connected graph has no Hamiltonian path, we can still look for spanning trees that come "close," in particular by having few branch vertices (since a Hamiltonian path would have none).

A conjecture of Matsuda, Ozeki, and Yamashita posits that, for any positive integer k, a connected claw-free n-vertex graph G must contain either a spanning tree with at most k branch vertices or an independent set of $2k+3$ vertices whose degrees add up to at most $n-3$. In other words, G has this spanning tree whenever $\sigma_{2k+3}(G) \geq n-2$. We prove this conjecture, which was known to be sharp.

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