Efficient automorphism breaking in graphs

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A graph G is called 2-distinguishable if it has a 2-partition $\{V_1, V_2\}$ of its set of vertices that is only preserved by the identity automorphism. The size of the smaller one of the sets V_1, V_2 is called the *cost* of breaking $\mathrm{Aut}(G)$.

Infinite locally finite graphs G are 2-distinguishable and have finite cost if and only if $\mathrm{Aut}(G)$ is countable. We present new bounds for for the cost of such graphs and for countable graphs with countable group that are not locally finite.

For infinite 2-distinguishable graphs with uncountable automorphism group the cost is infinite, but one of the sets V_1, V_2 may have zero density in $V(G)$. We show that this is the case for infinite, homogeneous trees, tree-like graphs and graphs of low growth.