A faster diameter problem algorithm for a chordal graph, with a connection to its center problem.

Summary: Let $G$ be a non-trivial simple graph with vertices $V(G) = V$ and edges $E(G) = E$, and let $n = |V|$, $m = |E|$. Computing the diameter of $G$ and the min-max center of $G$ ($C(G)$) are both quadratic-time ($O(m^2)$). A problem is strongly subquadratic-time if it is $O(m^{2-\epsilon})$ for some $\epsilon > 0$. If either the diameter problem or the center problem is strongly subquadratic-time, then the Strong Exponential Time Hypothesis would be violated. The same is true even for chordal graphs (graphs having no induced $n$-cycle for $n \geq 4$). This paper presents an algorithm that is faster than existing algorithms for the diameter problem for all chordal graphs.

With $\alpha(C(G))$ the size of a largest independent vertex subset of $C(G)$, it is proven here that the diameter problem for chordal graphs is $O(\alpha(C(G))m)$-time. The algorithm does not require knowledge of $C(G)$; nevertheless, it relates the diameter problem to the structure of $C(G)$.

Large-radius chordal graphs $G$ are likely to have small $\alpha(C(G))$, which suggests the existence of interesting classes of large-radius chordal graphs having strongly subquadratic-time diameter problems.

MSC:

68Wxx Algorithms in computer science
05Cxx Graph theory
68Rxx Discrete mathematics in relation to computer science
68Qxx Theory of computing

Keywords:
diameter algorithm; chordal graph; SETH
This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.