Bounds on the size of identifying codes for graphs of maximum degree Δ *

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Identifying codes in graphs are related to the classical notion of dominating sets and its locating variant [SR84]. They have a property which allows unique identification of all vertices of the graph. Identifying codes were first introduced in 1998 [KCL98], and have since been studied widely in the communities of both graph theory and coding theory.

Formally, given an undirected simple graph $G = (V, E)$, an *identifying code* is a subset $C \subseteq V$ such that C is a dominating set of G, and for every pair of vertices $\{u, v\} \in V$ there exists $x \in C$ which dominates exactly one of the vertices of the pair $\{u, v\}$.

In this talk we discuss the relationship between the maximum degree Δ of a graph and the lower and upper bounds for the minimum cardinality of an identifying code in this graph. Such considerations are an extension of the known upper bound [GM07] of $n-1$ on the size of the identifying code of an identifiable graph on n vertices. Specifically, we show that any identifiable triangle-free graph G has an identifying code of cardinality at most $n - \frac{n}{3\Delta+3}$, and of cardinality at most $n - \frac{n}{2\Delta+2}$ if it is Δ-regular. We also present related bounds for graphs of girth at least 5.

References

[GM07] S. Gravier and J. Moncel. On graphs having a $V\backslash\{x\}$ set as an identifying code. *Discrete Mathematics*, 307(3-5):432–434, 2007.

[KCL98] M. G. Karpovsky, K. Chakrabarty, and L. B. Levitin. On a new class of codes for identifying vertices in graphs. *IEEE Transactions on Information Theory*, 44:599–611, 1998.

[SR84] P. J. Slater and D. F. Rall. On location-domination numbers for certain classes of graphs. *Congressus Numerantium*, 45:97-106, 1984.

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