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Multi-level distance labeling (or radio labeling) can be regarded as an extension of distance two labeling. For a graph G, we denote its diameter by $\mathrm{diam}(G)$; and the distance between any two vertices, u and v, is denoted by $d(u, v)$. A *multi-level distance labeling* of G is a function f that assigns to each vertex a non-negative integer such that for any vertices u and v, it is satisfied that:

$$|f(u) - f(v)| \leq \mathrm{diam}(G) - d(u, v) + 1.$$

The *span* of f is $\max\{f(V)\}$. The *radio number* of G is the minimum span of a radio labeling for G. The radio numbers for paths and cycles were studied by Chartrand at el. [1, 2], and were recently completely determined by Liu and Zhu [3]. We extend the results on paths to spiders – trees with at most one vertex of degree more than two. We prove a lower bound for the radio number of spiders in terms of the lengths of their legs, and characterize the spiders achieving this bound. In particular, we show that the bound is achieved if and only if the sum of the lengths of all the legs is large enough.

References

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