On k-Rainbow Colorings in Graphs

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Let G be an edge-colored nontrivial connected graph, where adjacent edges may be colored the same. A path P in G is a rainbow path if no two edges of P are colored the same. Rainbow paths have been studied extensively. In this work, we introduce a closely related concept. For an integer $k \geq 2$, a path P in G is a k-rainbow path if every subpath of P having length ℓ for each ℓ with $\ell \leq k$ is a rainbow path. An edge coloring of G is a k-rainbow coloring if every pair of distinct vertices of G are connected by a k-rainbow path in G. The minimum number of colors for which G has a k-rainbow coloring is called the k-rainbow connection number of G. Recent results and open questions are presented on this area of research.

Keywords: rainbow connection, k-rainbow connection, information-transfer paths.