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Random Hypergraphs and the Size-Ramsey Number of Subdivisions of Graphs

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Given a graph G and an integer $k \geq 2$, the multicolor size-Ramsey number of G, denoted by $\hat{R}(G,k)$, is the smallest integer m such that there is a graph H with m edges for which, in every edge coloring of H with k colors, H contains a monochromatic copy of G. After, the counterexample of Rödl and and Szemerédi (2000) on the linearity of the size-Ramsey of bounded degree graphs in terms of the number of its vertices, the problem that which graphs have linear size-Ramsey have been extensively studied in the literature. Different classes of sparse graphs like paths, bounded degree trees and cycles are shown to have linear size-Ramsey number. In this talk, we will show how different new techniques like random hypergraphs, expander graphs and universal embedding methods can be combined to prove linear upper bounds for the size-Ramsey number of the subdivision of bounded degree graphs, when the length of the subdivisions is of order $\Omega(\log n)$, where n is the number of vertices. Interestingly, the bounds, in terms of the maximum degree Δ and the number of colors k, show different behavior when the length of subdivisions is even or odd.

This is a joint work with Yoshiharu Kohayakawa and Meysam Miralaei.