STRONG CODING TREES AND APPLICATIONS TO RAMSEY THEORY ON INFINITE GRAPHS

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The Infinite Ramsey Theorem states that given $n, r \geq 1$ and a coloring of all n-sized subsets of $\mathbb{N}$ into r colors, there is an infinite subset of $\mathbb{N}$ in which all n-sized subsets have the same color. Extensions of Ramsey's Theorem to homogeneous structures have been studied for several decades, in particular infinite graphs. In this setting, one colors all copies of some fixed finite graph A inside a given infinite graph G, the goal being to find an infinite subgraph G' isomorphic to G in which the copies of A take as few colors as possible are used. The minimum guaranteed number of colors is called the *big Ramsey degree of A in G*. The question of which homogeneous structures have finite big Ramsey degrees for all of its finite substructures gained new momentum when it was brought into focus by Kechris, Pestov, and Todorcevic (KPT) in their work finding a correspondence between the Ramsey property and extreme amenability. Answering a question of KPT, Zucker found a correspondence between Ramsey degrees for infinite structures and completion flows, providing additional motivation for the search for infinite structures with good Ramsey properties.

In this talk, I will present the methodology of *strong coding trees* and their Ramsey theory. These were developed in order to find upper bounds for the Ramsey degrees of the random k-clique-free graphs. It turned out that strong coding trees are also useful for coding copies of the Rado graph and other homogeneous structures without forbidden configurations. We will give an overview of how these methods are used to find upper bounds for the Ramsey degrees of the random k-clique-free graphs, and to develop the infinite dimensional Ramsey theory of the Rado graph, answering questions implicit in KPT.

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