DISCRETE MATHEMATICS
SEMINAR

The Turán Density of 4-Uniform Tight Cycles

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Abstract: For any uniformity r and residue k modulo r, we give an exact characterization of the r-uniform hypergraphs that homomorphically avoid tight cycles of length k modulo r, in terms of colorings of (r-1)-tuples of vertices. This generalizes the result that a graph avoids all odd closed walks if and only if it is bipartite, as well as a result of Kam?ev, Letzter, and Pokrovskiy in uniformity 3. In fact, our characterization applies to a much larger class of families than those of the form C_kˆ(r)={r-uniform tight cycles of length k modulo r}.

We also outline a general strategy to prove that, if C is a family of tight-cycle-like hypergraphs (including but not limited to the families C_kˆ(r)) for which the above characterization applies, then all sufficiently long cycles in C will have the same Turán density. We demonstrate an application of this framework, proving that there exists an integer L_0 such that for every L¿L_0 not divisible by 4, the tight cycle Cˆ(4)_L has Turán density 1/2.

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