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GENERALIZED TURÁN PROBLEM FOR DIRECTED CYCLES

In extremal graph theory, by $\text{ex}(n, H, F)$, we denote the maximum number of copies of graph H that an n -vertex graph without any copies of F can contain. We study this quantity for oriented graphs when both H and F are directed cycles. Let \vec{C}_i denote a directed cycle on i vertices. We establish the order of magnitude of $\text{ex}(n, \vec{C}_k, \vec{C}_\ell)$ for all pairs (k, ℓ) and also calculate the value up to a lower order error term when $k \ll \ell$, $\ell \nmid k$.

We then present partial results and conjectures in the remaining cases, which show a multitude of possible extremal constructions, quite uncommon for a problem with such a simple statement.

This is joint work with Andrzej Grzesik, Bartłomiej Kielak, Piotr Kuc and Tomasz Ślusarczyk.