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Triangle packings and 1-factors in oriented graphs. (English) Zbl 1208.05038

Summary: An oriented graph is a directed graph which can be obtained from a simple undirected graph by orienting its edges. In this paper we show that any oriented graph $G$ on $n$ vertices with minimum indegree and outdegree at least $(1/2 - o(1))n$ contains a packing of cyclic triangles covering all but at most 3 vertices. This almost answers a question of Cuckler and Yuster and is best possible, since for $n \equiv 3 \mod 18$ there is a tournament with no perfect triangle packing and with all indegrees and outdegrees $(n - 1)/2$ or $(n - 1)/2 \pm 1$. Under the same hypotheses, we also show that one can embed any prescribed almost 1-factor, i.e. for any sequence $n_1, \ldots, n_t$ with $\sum_{i=1}^t n_i \leq n - O(1)$ we can find a vertex-disjoint collection of directed cycles with lengths $n_1, \ldots, n_t$. In addition, under quite general conditions on the $n_i$ we can remove the $O(1)$ additive error and find a prescribed 1-factor.

MSC:
05C20 Directed graphs (digraphs), tournaments
05D05 Extremal set theory

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