Abstract

In 1978 Caccetta and Haggkvist proposed the following conjecture for strict digraphs, which has two forms:

The first form is: Let $G = (V, E)$ be a directed graph of order n and girth g such that $d^+(x) \geq k$ for every vertex x. Then $n \geq k(g-1)+1$.

The second form is: If G is a directed graph with n vertices and if each vertex of G has outdegree at least k, then G contains a directed cycle of length at most $\left\lceil \frac{n}{k} \right\rceil$.

Here we investigate two main approaches to prove the conjecture for k≤5:

(1) The first approach is by Hamidoune, which proves the conjecture for k=3.

(2) The second approach is by Hoang and Reed, which proves the conjecture for k≤5.