

# The Directed Grid Theorem

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The grid theorem, originally proved by Robertson and Seymour in Graph Minors V in 1986, is one of the most central results in the study of graph minors. It has found numerous applications in algorithmic graph structure theory, for instance in bidimensionality theory, and it is the basis for several other structure theorems developed in the graph minors project.

In the mid-90s, Reed and Johnson, Robertson, Seymour and Thomas, independently, conjectured an analogous theorem for directed graphs, i.e. the existence of a function  $f : \mathbb{N} \rightarrow \mathbb{N}$  such that every digraph of directed tree-width at least  $f(k)$  contains a directed grid of order  $k$ . In an unpublished manuscript from 2001, Johnson, Robertson, Seymour and Thomas give a proof of this conjecture for planar digraphs. But for over a decade, this was