

Directed Bounded Expansion

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Wednesday, 16th of November, 2016, 2:00 p.m., room TEL 716

Abstract

Bounded expansion and nowhere dense graph classes, introduced by Nešetřil and Ossona de Mendez form a large variety of classes of uniformly sparse graphs which includes the class of planar graphs, actually all classes with excluded minors, and also bounded degree graphs. Since their initial definition it was shown that these graph classes can be defined in many equivalent ways: by generalised colouring numbers, neighbourhood complexity, sparse neighbourhood covers, a game known as the splitter game, and many more.

We study the corresponding concepts for directed graphs. We show that the densities of bounded depth directed minors and bounded depth topological minors relate in a similar way as in the undirected case. We provide a characterisation of bounded expansion classes by a directed version of the generalised colouring numbers. As an application we show how to construct sparse directed neighbourhood covers and how to approximate directed distance- r dominating sets on classes of bounded expansion. On the other hand, we show that linear neighbourhood complexity does not characterise directed classes of bounded expansion.

Joint work with Roman Rabinovich, Sebastian Siebertz and Siamak Tazari.