Discrete Mathematics & Combinatorics

Graph classes in enumeration

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Enumerating, counting, and determining the maximum number of various objects in graphs have long been established as important areas within graph theory and graph algorithms. As the number of enumerated objects is very often exponential in the size of the input graph, enumeration algorithms fall into two categories depending on their running time: those whose running time is measured in the size of the input, and those whose running time is measured in the size of the output. Based on this, we concentrate on the following two types of algorithms.

1. Exact exponential time algorithms. The design of these algorithms is mainly based on recursive branching. The running time is a function of the size of the input graph, and very often it also gives an upper bound on the number of enumerated objects any graph can have.

2. Output polynomial algorithms. The running time of these algorithms is polynomial in the number of the enumerated objects that the input graph actually contains. Some of these algorithms have even better running times in form of incremental polynomial or polynomial delay, depending on the time the algorithm spends between each consecutive object that is output.

The methods for designing the two types of algorithms are usually quite different. Common to both approaches is that efforts have traditionally mainly been concentrated on arbitrary graphs, whereas graphs with particular structure have largely been left unattended. In this talk we look at enumeration of objects in graphs with special structure. In particular, we focus on enumerating minimal dominating sets in various graph classes.