Graph structure and algorithms

(Organizer and Chair / Responsable et président: **Kathie Cameron** (Wilfrid Laurier University))

KATHIE CAMERON, Wilfrid Laurier University

Recognizing and Colouring Even-Hole-Free Apple-Free Graphs

A hole is an induced cycle with at least four vertices. An apple is a hole with a pendant edge. We prove that apple-free even-hole-free graphs can be decomposed by clique cutsets into, essentially, unit circular-arc graphs. This is the basis for our algorithms for recognizing and colouring these graphs. Our recognition algorithm is more efficient (O(nm)) than known algorithms for recognizing even-hole-free graphs (O(n^{11})). Colouring apple-free graphs is NP-hard and the complexity of colouring even-hole-free graphs is unknown, but our algorithm colours apple-free even-hole-free graphs in O(n^3) time. This is joint work with Steven Chaplick and Chính Hoàng.

MURILO DA SILVA, Simon Fraser University

Decomposing (even-hole, bull)-free graphs

A decomposition theorem for a given graph class C is a characterization stating that if G belongs to C, then G is either "basic" (has a well understood structure) or G has a prescribed cutset, along which it can be decomposed. Even-hole-free graphs can be decomposed by 2-joins and star cutsets. We discuss in this talk how imposing more structure, such as forbidding the bull graph, one can obtain a decomposition using more refined versions of star cutsets.

ELAINE ESCHEN, West Virginia University

Polynomial-time efficient domination on $(P_6, house)$-free graphs and $(P_6, bull)$-free graphs

The NP-completeness of the Efficient Domination(ED) problem on chordal graphs and claw-free graphs implies: if F is not a linear forest, ED is NP-complete on F-free graphs. For F-free graphs (F a linear forest), the only remaining open case is the complexity of ED on P_6-free graphs. We show ED/WeightedED is solvable in polynomial time on $(P_6, house)$-free graphs and $(P_6, bull)$-free graphs, using a known reduction from ED/WED on G to Maximum Weight Independent Set on G^2. Moreover, we show that the square of a P_6-free graph with an efficient dominating set is hole-free. (With A. Brandstädt, E. Friese)

SHENWEI HUANG, Simon Fraser University

Bounding Clique-width via Perfect Graphs

Given two graphs H_1 and H_2, a graph G is (H_1, H_2)-free if it contains no induced subgraph isomorphic to H_1 or H_2. We continue a recent study into the clique-width of (H_1, H_2)-free graphs and present three new classes of (H_1, H_2)-free graphs of bounded clique-width. The three new graph classes have in common that one of their two forbidden induced subgraphs is the diamond. To prove our results we develop a technique based on bounding clique covering number in combination with reduction to subclasses of perfect graphs.

This is a joint work with Konrad Dabrowski and Daniel Paulusma.

JERRY SPINRAD, Vanderbilt University

Double Threshold Digraphs

Double threshold graphs generalize semi-orders. Double threshold graphs use 2 thresholds t1 and t2. If w(x) and w(y) differ by at most t1, x and y must be incomparable. If w(x)-w(y) is greater than t2, x must be greater than y. If x exceeds y by an amount between t1 and t2, we may choose x greater than y, or x and y incomparable.

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Every directed acyclic graph G can be represented with some minimum ratio t2/t1. We discuss properties of graphs where this ratio is fixed, giving both algorithms and characterizations, and discussing the motivation for studying this property.