Optimizing Bull-free Perfect Graphs

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A *bull* is a graph obtained by adding a pendant vertex at two vertices of a triangle. Chvátal and Sbihi [1] showed that the Strong Perfect Graph Conjecture holds for bull-free graphs by defining a decomposition operation with respect to homogeneous pairs. Reed and Sbihi [3] gave a polynomial-time recognition algorithm for bull-free perfect graphs.

In this talk, we present a polynomial-time algorithm for solving the optimization problems: maximum weighted clique and minimum weighted colouring for bull-free perfect graphs.

Given a bull-free perfect graph with no homogeneous set, our solution considers four cases according to the existence of a hole or of an even antihole in the graph. In case the graph has no hole and no antihole, we have a weakly triangulated graph; solutions for the optimization problems are known in this case. In case the graph has an even hole and no antihole, we defined in [2] a decomposition which allowed us to exhibit a perfect order in this case. We can further exploit this decomposition to show that we actually have a comparability graph; both comparability and co-comparability graphs are well-studied classes of perfect graphs. In case the graph has an even hole and and even antihole, we show how to use Chvátal's decomposition with respect to a special homogeneous pair to optimize.

References

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[3] B.A. Reed and N. Sbihi. Recognizing bull-free perfect graphs. *Graphs and Combinatorics*, 11:171–178, 1995.

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