Clique-width of Restricted Graph Classes

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Abstract:

The *clique-width* of a graph G, is the minimum number of labels needed to construct G using the following four operations:

- creating a new graph consisting of a single vertex v with label i;
- taking the disjoint union of two labelled graphs G_1 and G_2;
- joining each vertex with label i to each vertex with label j $(i \neq j)$;
- renaming label i to j.

Clique-width is of great theoretical interest because many natural algorithmic problems that are NP-complete in general can be solved efficiently on graph classes of bounded clique-width. This includes all problems expressible in monadic second order logic with quantification over vertices, along with other problems such as vertex colouring and Hamiltonian cycle. Clique-width is a tricky parameter to deal with. Indeed, even for low values of c, such as $c = 4$, we do not know if graphs of clique-width c can be detected in polynomial time.

I will describe some of the tools available for dealing with clique-width and summarize our recent work on classifying which classes of graphs have bounded clique-width, in particular for: H-free graphs [6], H-free bipartite graphs [5], H-free split graphs [2], H-free chordal graphs [1], H-free weakly chordal graphs [1] and (H_1, H_2)-free graphs [1, 3, 4, 6].

References

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