Protrusions in Graphs and Their Applications

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A protrusion in a graph is a subgraph of constant treewidth that can be separated from the graph by removing a constant number of vertices. More precisely, given a graph $G = (V, E)$ and $S \subseteq V$, we denote by $\partial(S)$ the set of vertices in S that have a neighbour in $V \setminus S$.

Definition 1. *Given a graph $G = (V, E)$, we say that a set $X \subseteq V$ is an r -protrusion of G if $|\partial(X)| \leq r$ and the treewidth of the subgraph $G[X]$ of G induced by X is at most r .*

Protrusions were introduced in [1] as a tool for obtaining kernelization meta-theorems. Loosely speaking, if a parametrized problem can be expressed in a certain logic, then a sufficiently large protrusion can be replaced by a smaller “equivalent” one. Protrusions appear to be a handy tool for obtaining kernelization and approximation algorithms [2,3]. In this talk we discuss combinatorial properties of graphs implying existence of large protrusions and give a number of algorithmic applications of protrusions.

The talk is based on joint works with Hans L. Bodlaender, Daniel Lokshtanov, Elko Penninkx, Saket Saurabh, Venkatesh Raman, and Dimitrios M. Thilikos [1,2,3].

References

1. Bodlaender, H., Fomin, F.V., Lokshtanov, D., Penninkx, E., Saurabh, S., Thilikos, D.M.: (Meta) Kernelization. In: Proceedings of the 50th Annual Symposium on Foundations of Computer Science (FOCS 2009), pp. 629–638. IEEE, Los Alamitos (2009)
2. Fomin, F.V., Lokshtanov, D., Saurabh, S., Thilikos, D.M.: Bidimensionality and kernels. In: Proceedings of the 21th ACM-SIAM Symposium on Discrete Algorithms (SODA 2010), pp. 503–510 (2010)
3. Fomin, F.V., Lokshtanov, D., Raman, V., Saurabh, S.: Bidimensionality and EP-TAS, CoRR abs/1005.5449 (2010)