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Effective bases of closure systems with the unique criticals

We discuss the canonical basis of Guigues and Duquenne, for an arbitrary closure system, and consider its natural optimization in the form of a K-basis. Other general observations include some new parameters of optimum bases, similar to those introduced by D.Maier.

This allows to treat the size of a basis as a sum of three addends, and some of the addends could be optimized independently.

Then we turn to closure systems that we call UC-systems. These can be effectively recognized from the canonical basis: each essential closed set has a unique critical subset. For some of subclasses of UC-systems, such as closure systems without D-cycles, we can effectively find bases that minimize some parameters we mention in the first part of the presentation.

Nevertheless, the problem of minimization of other parameters for this class is NP-complete. Finally, for some classes of convex geometries, which are also UC-systems, we find tractable optimum bases. In particular, we generalize the result of P.Hammer and A. Kogan about optimum basis of quasi-acyclic closure systems. This generalization is different from CQ (component quadratic)-closure systems described in the recent work of E.Boros, O.Cepek, A. Kogan and P. Kucera.