

A Polynomial Kernel for Funnel Arc Deletion Set*

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Abstract

In DIRECTED FEEDBACK ARC SET (DFAS), we search for a set of at most k arcs which intersect every cycle in the input digraph. It is a well-known open problem in parameterized complexity to decide if DFAS admits a kernel of polynomial size. We consider \mathcal{C} -ARC DELETION SET (\mathcal{C} -ADS), a variant of DFAS where we want to remove at most k arcs from the input digraph in order to turn it into a digraph of a class \mathcal{C} . In this work, we choose \mathcal{C} to be the class of *funnels*. A funnel is a DAG such that for every source-sink path there is some arc which is not contained in any other source-sink path.

FUNNEL-ADS is NP-hard even if the input is a DAG, but is fixed-parameter tractable with respect to k . So far no polynomial kernels for this problem were known. Our main result is a kernel for FUNNEL-ADS with $\mathcal{O}(k^6)$ many vertices and $\mathcal{O}(k^7)$ many arcs, computable in linear time.

*The corresponding conference paper of this work was submitted to STACS 2020 and is currently under review. The full version is available on [arXiv](#).