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On the Boundedness Problem for Pushdown Vector Addition Systems

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Today's increasing demand to write more and more software that executes concurrently led to a raising demand for algorithmic methods that permit to verify that these programs are indeed "correct". Vector addition systems (VAS), or equivalently Petri nets, are a well-studied and fundamental model for the analysis of these concurrent systems. Despite their fairly large expressive power, many verification problems for VAS are still decidable: coverability, boundedness, reachability, liveness, etc.

In this work, we study an extension of VAS, called Pushdown VAS, that allows them to additionally use a stack over a finite alphabet, e.g., to model recursion of the underlying programs. Our main contribution is an algorithm for the boundedness verification problem together with an analysis of its complexity. This algorithm is based on the well-known Karp-Miller tree for VAS. We show that the worst-case running time of this algorithm is hyper-Ackermannian.

(Joint work with J. Leroux and M. Praveen)