

# Master's Internship Proposal (M2)

**Where:** Laboratoire Spécification et Vérification  
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**Title:** Limitedness problem for VASS

## Description:

Given a nondeterministic finite automaton whose transitions are labeled with nonnegative integer weights (costs), one can associate to each run its cost, which is the sum of the weights of each individual transition along the run. The limitedness problem asks, given such an automaton, whether there is a bound  $B$  such that each accepted word also has an accepting run whose cost is bounded by  $B$ . In addition to its natural interpretation, this problem has attracted interest due to its connexions with the theory of regular languages (finite power property, start height problem). The problem has a positive answer, originally given by Hashigushi, see for instance [3]. Several extensions have also been investigated (Bojańczyk, Colcombet, Kirsten).

Recently, the limitedness problem has also been considered for other classes of counter systems, such as variations of vector addition systems with states (VASS). For instance, it is undecidable for vector addition systems with states (VASS) equipped with a reset [1], but decidable for such VASS in dimension 1 [2].

The aim of the internship is to understand the limits between decidability and undecidability for variations of vector addition systems (parameters are the dimension, and extra features, *e.g.*, the ability to test one counter to 0 which may lead to undecidability).

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## References

- [1] P. Abdulla, P. Krcal, , and W. Yi. Limitedness of reset vector addition systems. Available at <http://user.it.uu.se/~pavelk/publications/r-vass.pdf>.
- [2] P. A. Abdulla, P. Krcal, and W. Yi. R-automata. In *Proceedings of the 19th international conference on Concurrency Theory, CONCUR '08*, pages 67–81, Berlin, Heidelberg, 2008. Springer-Verlag.
- [3] H. Leung and V. Podolskiy. The limitedness problem on distance automata: Hashiguchi's method revisited. *Theoretical Computer Science*, 310(1-3):147–158, 2004.