Verification of shared-memory systems is often undecidable. For instance, systems consisting of two pushdown processes with a shared boolean variable can already simulate a Turing machine. Here we consider a parametric version of this model, where the number of pushdown processes is arbitrary. Surprisingly, this model enjoys various decidable verification problems, due to the lack of process identities.

**Special instances**

- **Reachability**: is there a run where the leader perform a special action \( T \)?
- **Repeated reachability**: is there a run where the leader does \( T \) infinitely many times?
- **Universal reachability**: does the leader do \( T \) in all maximal runs?

**Previous results**

- The reachability problem is \( \text{PSPACE} \)-complete [2].
- The repeated reachability problem is \( \text{PSPACE} \)-hard and in \( \text{NEXPTIME} \) [1].

**Approach**

We first study repeated reachability and universal reachability.

**Theorem**

- The repeated reachability problem is \( \text{PSPACE} \)-complete.
- The universal reachability problem is \( \text{NEXPTIME} \)-complete.

We then use the results about these problems to design an algorithm for the verification of regular \( \mathcal{C} \)-expanding properties. The difficulty is that such properties talk about both the actions of the leader, and of the contributors (instead of actions of the leader only). The idea is to simulate the \((\mathcal{C}, \mathcal{D})\)-system by one in which all actions of the contributors are reflected in actions of the leader.

**Results**

- We improved the known \( \text{NEXPTIME} \) upper bound for the repeated reachability problem, showing that it is \( \text{PSPACE} \)-complete.
- We investigated a new problem, universal reachability, and showed that it is \( \text{NEXPTIME} \)-complete. The main difference with previous work is that we consider both finite and infinite runs, which require to look into deadlocks.
- We showed that the more general problem of verifying regular \( \mathcal{C} \)-expanding properties – talking about both leader and contributor actions – is decidable, and also \( \text{NEXPTIME} \)-complete.

**References**