Towards Proof-Theoretic Interpretations for LTL Monitoring

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In this talk we will present a study on how runtime verification (RV) algorithms can be given one common proof-theoretic interpretation. In RV, there is a lot of work that deals with verification algorithms, yet there is no standard notation for such algorithms making it hard to understand and compare such work.

We aim to have a common underlying framework where such algorithms can be interpreted in a proof-theoretic way. Therefore we are going to investigate how verification algorithms, specifically the algorithms by Geilen [2], Sen *et al.* [3] and Bauer *et al.* [1], can be mapped to this kind of interpretation. In particular, we investigate whether these algorithms can be mapped to the coinductive interpretations for LTL. The coinductive interpretation appears to lend itself more naturally to the formalisation of runtime verification algorithms given the model over which LTL is defined i.e. infinite strings. Coinduction is often used for analysis that have an extensional flavour which seems in line with the notation of runtime monitoring (where you arrive to a conclusion by observing only part of the entity being analysed).

Preliminary results show that Geilen's algorithm can be mapped to such proof systems, hence allowing us to integrate his runtime verification algorithm as a proof search over LTL rules. Furthermore, this algorithm is defined in a coinductive manner, thus confirming our initial idea, that coinduction is the ideal interpretation for verification. Yet, work is still ongoing and the results are not yet conclusive. If we are able to map every algorithm to our proof system, the latter can be seen as a framework for verification algorithms.

References

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