– Erratum –
On the Expressiveness and Complexity of ATL

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The claim that ATL^+ model checking is Δ_3^{P}-complete is wrong (Theorem 19 in the conference version [LMO07], and Proposition 3.14 and Theorem 3.17 in the journal version [LMO08]). The error actually already appears in [Sch04]: the fact that ATL^+ can be translated into ATL does not imply that ATL^+ admits memoryless winning strategies. As an easy example, consider the formula $\langle\!\langle A \rangle\!\rangle (\mathbf{F}\, a \wedge \mathbf{F}\, b)$ in the one-player game depicted on Figure 1: memoryless strategies would only visit one side of the structure.

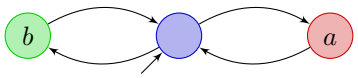

Figure 1: A one-player game

The correct result is proven in [WSH15]:

Theorem 1 ([WSH15])**.** *Model checking ATL^+ is* PSPACE*-complete over explicit CGSs.*

It is not difficult to extend this result to implicit CGSs. This can be proven e.g. by using a labelling algorithm relying on the translation of ATL^+ into ATL: proceeding bottom-up, we consider each strategy quantifier in the formula. It has the form $\langle\!\langle A \rangle\!\rangle \varphi$ where φ is a boolean combination of basic path formulas. Such a formula can be translated into a disjunction of several ATL formulas. It then suffices to enumerate these disjuncts and check for each state whether one of them holds true.

Hence:

Theorem 2. *Model checking ATL^+ is* PSPACE*-complete over implicit CGSs and ATSs.*

References

[LMO07] François Laroussinie, Nicolas Markey, and Ghassan Oreiby. On the expressiveness and complexity of ATL. In Helmut Seidl, editor, *Proceedings of the 10th International Conference on Foundations of Software*

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[LMO08] François Laroussinie, Nicolas Markey, and Ghassan Oreiby. On the expressiveness and complexity of ATL. *Logical Methods in Computer Science*, 4(2:7), May 2008.

[Sch04] Pierre-Yves Schobbens. Alternating-time logic with imperfect recall. In *Proceedings of the 1st Workshop on Logic and Communication in Multi-Agent Systems (LCMAS'03)*, volume 85(2) of *ENTCS*. Elsevier, 2004.

[WSH15] Farn Wang, Sven Schewe, and Chung-Hao Huang. An extension of ATL with strategy interaction. *ACM Transactions on Programming Languages and Systems*, 37(3), June 2015.