Erratum

On the Expressiveness and Complexity of ATL

François Laroussinie, Nicolas Markey, Ghassan Oreiby

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The claim that ATL+ model checking is $\Delta_3^P$-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 $\langle \langle A \rangle \rangle (F a \land F b)$ in the one-player game depicted on Figure 1: memoryless strategies would only visit one side of the structure.

\begin{figure}[h]
\centering
\includegraphics[width=0.3\textwidth]{figure1}
\caption{A one-player game}
\end{figure}

The correct result is proven in [WSH15]:

**Theorem 1** ([WSH15]). Model checking $\text{ATL}^+$ 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 $\varphi$ 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 $\text{ATL}^+$ is PSPACE-complete over implicit CGSs and ATSSs.

References


