Summary: Axiom pinpointing has been introduced in description logics (DL) to help the user understand the reasons why conclusions hold by computing minimal subsets of the knowledge base that have the consequence in question (MinA). Most of the pinpointing algorithms described in the DL literature are obtained as extensions of tableau-based reasoning algorithms for computing consequences from DL knowledge bases. In this paper, we show that automata-based algorithms for reasoning in DLs and other logics can also be extended to pinpointing algorithms. The idea is that the tree automaton constructed by the automata-based approach can be transformed into a weighted tree automaton whose so-called behaviour yields a pinpointing formula, i.e., a monotone Boolean formula whose minimal valuations correspond to the MinAs. We also develop an approach for computing the behaviour of a given weighted tree automaton. We use the DL $SZ$ as well as Linear Temporal Logic (LTL) to illustrate our new pinpointing approach.

MSC:

68T27 Logic in artificial intelligence
68Q45 Formal languages and automata
68T30 Knowledge representation

Keywords:

axiom-pinpointing; automated reasoning; weighted automata; explanation; description logics

Software:

Pellet; KL-ONE; Racer

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References:


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