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Temporal inconsistencies detection in temporal Knowledge base and its reparation

Time is crucial in information processing because events occur at specific points in time and also the relationships among objects exist over time. The ability to model this temporal dimension is therefore necessary in real-world applications such as banking, medical records and geographical information systems.

Ontologies are a central research topic for the Semantic Web community, where OWL and its various fragments have been adopted as a W3C standard ontology language. OWL is derived from the well known *Description Logics* <<*DLs*>> which provide the basic representation features of OWL.

Classical ontology languages generally reflect static information and do not support full access to temporal data and all reasoning tasks such as satisfiability problems, query answering etc. A major challenge in this task of dealing with temporal information comes from the combined need of modeling it and being able to handle the inefficiency of data, especially when this latter one is inconsistent, i.e, in contradiction with the domain of interest which could also be dynamic.

Reasoning over temporal ontologies has been extensively studied in the literature, in particular, for Temporal extensions of description logics <<TDL>>. In this thesis, we mainly study the practical feasibility of reasoning over temporal DLite <<TDLLite>> extensions.

TDLLite ontologies, also called *temporal knowledge bases* <<*TKBs*>>, comprises two components, namely a TBox expressing the global knowledge of an application domain and an ABox expressing timestamped factual knowledge about individuals from this domain.

A TBox is expressed as a finite set of general concept inclusions, intended to express the constraints of a given application domain via axioms that hold at each point in time. An ABox is a set of temporal assertions that represents data at different time points. Thus, data in the ABox are associated with various structural and semantic constraints expressed in the TBox. As a matter of fact, when data are created from multiple sources such constraints are not imposed a priori so violations of such constraints must be detected and repaired a posteriori. A major challenge in this respect is to deal with ABox *inconsistency* of temporalized DL KBs, i.e, where the ABox is inconsistent with a satisfiable TBox: a subset of the assertions in the ABox contradicts one or more TBox assertions.Then, the ABox is not reliable and must be repaired: repetition.

In the thesis, we address the problem of handling inconsistent data in Temporal Description Logic (TDL) knowledge bases. Considering the data part of the knowledge base as the source of inconsistency over time, we would like to propose an ABox repair approach. To do so, our goal is two folds: 1) detect temporal inconsistencies and 2) propose a data temporal reparation.

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Required skills:
knowledge representation and reasoning, logic-based reasoning, probabilistic approach

Location: Université Paris Cité, Laboratoire LIPADE

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