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Temporal Attributes: Status and Subsumption

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Abstract

Representing data that changes over time in conceptual data models is required by various application domains, and requires a language that is expressive enough to fully capture the operational semantics of the time-varying information. Temporal modelling languages typically focus on representing and reasoning over temporal classes and relationships, but have scant support for temporal attributes, if at all. This prevents one to fully utilise a temporal conceptual data model, which, however, is needed to model not only evolving objects (e.g., an employee's role), but also its attributes, such as changes in salary and bonus payouts. To characterise temporal attributes precisely, we use the DLRUS Description Logic language to provide its model-theoretic semantics, therewith essentially completing the temporal ER language ERVT. The new notion of status attribute is introduced to capture the possible changes, which results in several logical implications they entail, including their interaction with temporal classes to ensure correct behaviour in subsumption hierarchies, paving the way to verify automatically whether a temporal conceptual data model is consistent.