Giacomo + Sam Paper

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Abstract

Business Process Management (BPM) has been utilised in the development of models for data-aware logs. In this paper, we propose the addition of a knowledge base (KB) to optimise the loading process for the extraction and querying of a Declare model $\mathcal{M}$. By storing it in a KB, data is obtained and processed only once, rather than per query, as existing state of the art. For $\mathcal{C}$ Declare clauses, where $\mathcal{N}$ is the data loading cost, implementations without a KB suffer, resulting in $\mathcal{O}(\mathcal{C} * \mathcal{N})$ complexity. With a KB, data loading is necessary only once, enhancing the complexity to $\mathcal{O}(\mathcal{C} + \mathcal{N})$. In addition, we propose using MAX-SAT to solve the trace-alignment problem. Existing solutions determine the satisfiability of $\mathcal{M}$ over all possible traces, therefore are unable to solve trace alignments. By using MAX-SAT, we can determine the satisfiability of a trace to an extracted model (rather than the vice-versa), and obtain the necessary actions to *repair* the trace. With this approach, traces can be queried and repairs can be calculated at run-time. Therefore, the system is adaptable for real-time applications: a video game run, where repairs can be analysed to provide *suggestions* to the player; events leading up to a cyber-security attack, where repairs can provide advice on how to prevent the attack progressing etc. Finally, we propose using specialised LTLf operators not only for the definition and implementation of Declare clauses, but also for the querying of a given trace σ. As our logs are data-aware, we propose these operators support join conditions, allowing for more distinct clauses and therefore more precise models. Both of these approaches are novel for such a system.