

**Subject:** Modularization Concepts for Efficient Pattern Matching and Their Application in Model Synchronization Scenarios

**Research Focus/  
Cross-sectional Area:** Software engineering concepts (C4) & Verification and validation (C3)

**Description:**

The maintenance and evolution of "legacy" models have been identified as relevant research challenges for computational engineers in the C4 cross-sectional research area, which should be supported by domain-specific modeling languages and suitable engineering tools. The development and maintenance of such a tool landscape requires a correct and efficient implementation of bidirectional model synchronization to enable data exchange and ensure the consistency of related models across different engineering domains.

With the EMoflon tool suite developed at the Real-Time Systems Lab at the TU Darmstadt, model synchronization tasks are tackled by the declarative and rule-based technique of triple graph grammars (TGGs). As TGGs internally use graph patterns to formulate rule application conditions, pattern matching algorithms also have a determining role when considering the efficiency of model synchronization approaches.

This PhD thesis focuses on the development of new pattern modularization concepts and related optimization algorithms to support efficient pattern matching in a model synchronization context.

**Requirements:**

MSc in Computational Engineering, Computer Science, Information System Technology, or Electrical Engineering; Excellent knowledge of graph algorithms and modeling languages; Software Engineering background

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