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Automotive Engineering-Centric Agentic AI Workflow Framework

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Engineering workflows such as design optimization, simulation-based diagnosis, control tuning, and model-based systems engineering (MBSE) are iterative, constraint-driven, and shaped by prior decisions. Despite recent advances in simulation, optimization, and AI, the overall structure of engineering workflows still often treat engineering problems as isolated tasks, such as parameter optimization, surrogate modeling, or prediction, rather than as parts of a broader sequential decision making process. This limits their ability to support the adaptive, history-aware, and intervention driven character of real engineering practice. Several challenges follow from this mismatch. First, engineering workflows continue to rely heavily on expert intuition and experience. Second, historical engineering data are rarely used in a systematic way. Third, conventional optimization pipelines are usually organized around fixed objectives and constraints, with limited support for alternative interventions such as revising constraints, reformulating objectives, modifying models, or redirecting the search process.

This paper presents Agentic Engineering Intelligence (AEI), an industrial vision framework that models engineering workflows as constrained, history-aware sequential decision processes in which AI agents support engineer-supervised interventions over engineering toolchains. AEI links an offline phase for engineering data processing and workflow-memory construction with an online phase for workflow-state estimation, retrieval, and decision support. A control-theoretic interpretation is also possible, in which engineering objectives act as reference signals, agents act as workflow controllers, and toolchains provide feedback for intervention selection. **Representative automotive use cases in suspension design, reinforcement learning tuning, multimodal engineering knowledge reuse, aerodynamic exploration, and MBSE show how diverse workflows can be expressed within a common formulation.** Overall, the paper positions engineering AI as a problem of process-level intelligence and outlines a practical roadmap for future empirical validation in industrial settings.

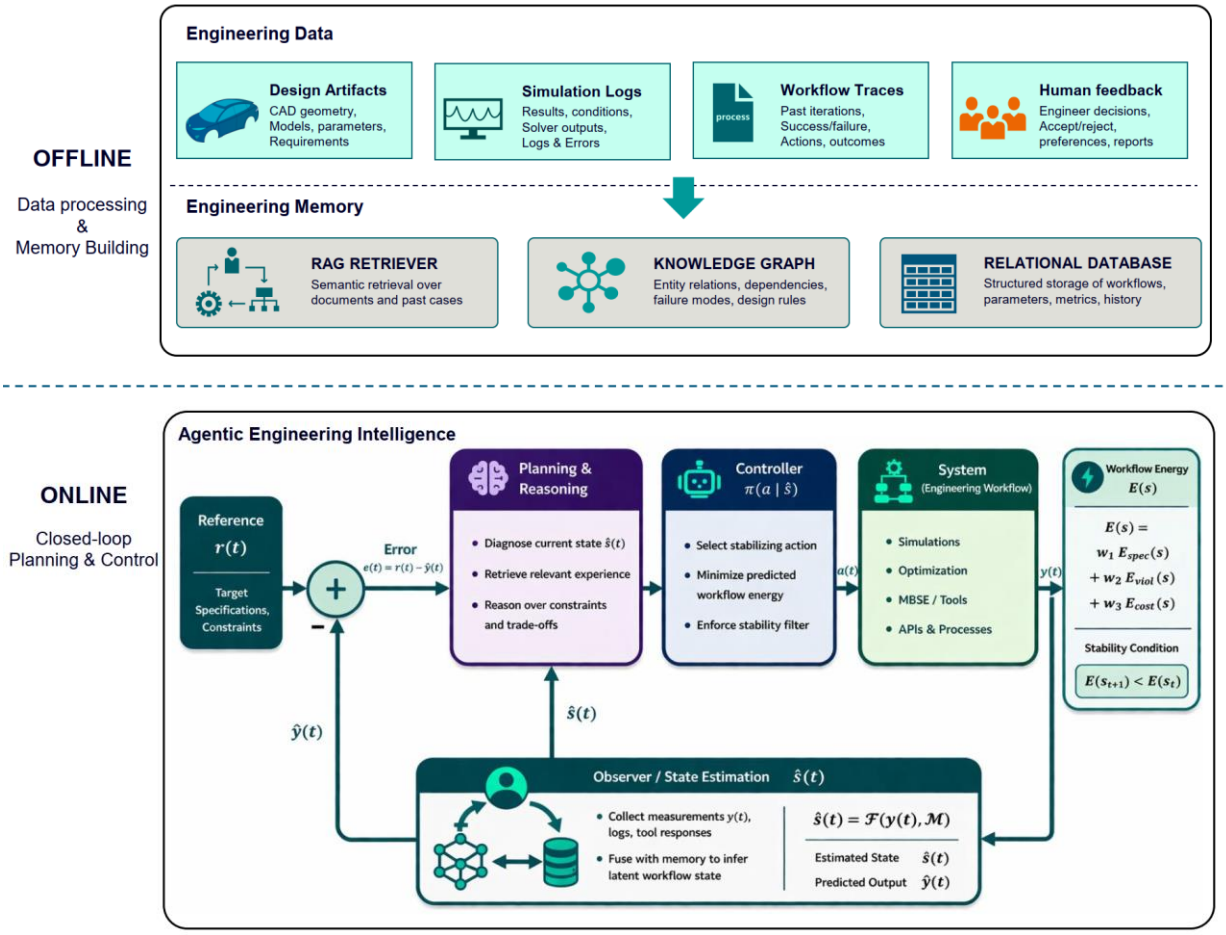

Figure: Offline engineering data processing and memory building phase, where the data is used for the online closed-loop Agentic Engineering Intelligence (AEI) loop.