

Assisted HARA Verification & Completion

AI-Driven Safety Workflow Optimization



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MOTIVATION & GOALS

Hazard Analysis and Risk Assessment (HARA) is the initial and therefore the most consequential step towards designing a **safety-related control system**. Building a HARA calls for an extensive knowledge of the use case, industry best practices, and standards-related requirements. Multiple iterative validation and rectification steps ensue.

Within the SafeFlow project, we study and gauge the potential of **LLM-supported modules** for HARA completion and validation. Given a user's faulty HARA, our developed workflows and agents play the role of (i) completing an unfinished HARA, (ii) aligning hazards with ISO 12100 requirements, and (iii) identifying and correcting human mistakes.

Project FactBox

Project Name SafeFlow
Project ID MFP II Prod.2
Duration 48 Months

Area 4.1
Cognitive Products

Project Lead
DI Dr. Amer Kajmakovic

APPROACH

Document-based Hazard Identification: Upon embedding and chunking safety-related documents, this steps used hbdscan-based clustering to identify hazards missed in a HARA
Standard-based HARA completion: Generates hazards based on an ISO-12100-based checklist of hazards

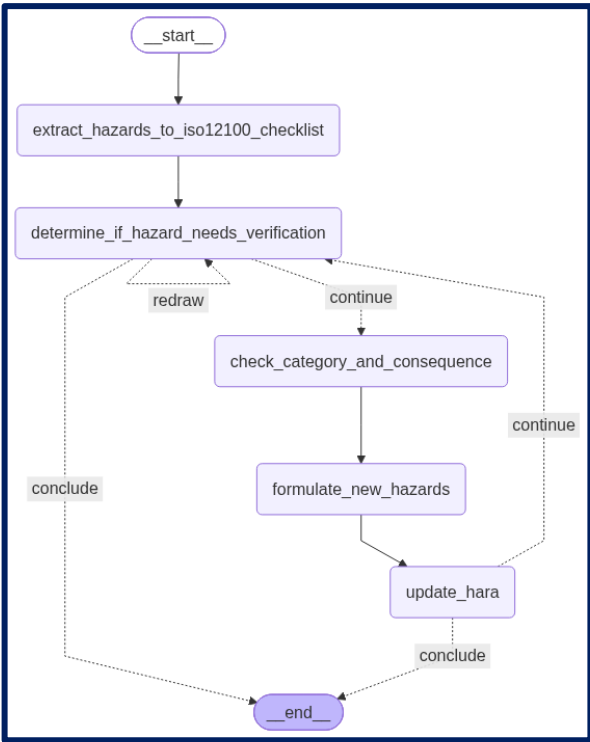
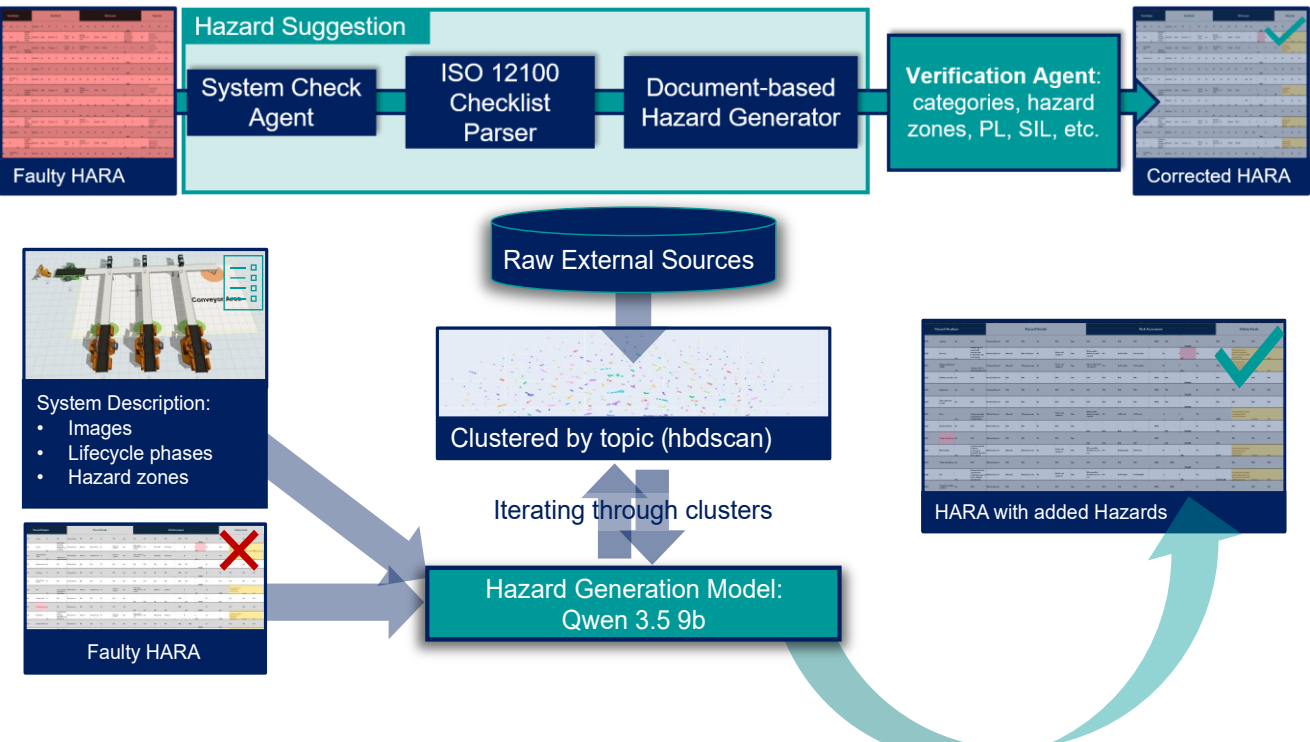
Hazard Verification & Correction: Checks the validity of hazard attributes in case of mistakes by the user or other modules

CONTRIBUTION

Scientific contribution
Development of a few-shot pipeline for HARA validation
Agentic System Architecture aligned with ISO 12100.
Document-based clustering for hazard identification.
Integration of incomplete or faulty HARA from users for correction.

Economic contribution
Support for engineers throughout the risk assessment lifecycle.
Certification-Aligned Performance – reducing time and resources.
Support with hazard and risk analysis verification and validation.
Reduction in Safety Documentation Overhead.

SYSTEM ARCHITECTURE



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