SafeFlow

AI-Driven Safety Workflow Optimization

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MOTIVATION & GOALS

Safety workflow processes are often **complex, repetitive, and tedious**, requiring strict adherence to **predefined standards** and structures. This makes the work monotonous, error-prone, and disengaging for safety engineers. To address these challenges, we aim to leverage **Large Language Models (LLMs)** to simplify processes and support safety engineers.

By accelerating safety-related tasks, LLMs will **enhance efficiency, reduce time to market, and lower costs**. Their knowledge-driven support improves decision-making, reduces mistakes, and optimizes performance by making safety processes more flexible, reliable, and scalable.

Project FactBox

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

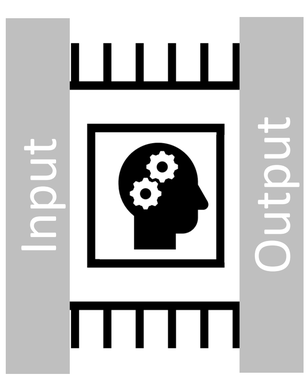
Area 4.1
Cognitive Products

Project Lead
DI Dr. Amer Kajmakovic

APPROACH

Static Data
- Standards & Norms
- Siemens SIOS Portfolio
- VDMA library
- HARA generic examples

Dynamic Data
- Project-specific:
- System configuration
- Component datasheets
- Documentation



- Safety Instrumented Functions
- Norm-Specific Recommendations
- Safety Coverage Estimation
- Hazard and Risk Analysis
- Safety-Related Testing
- Project and Configuration Updates
- Safety Documentation

CONTRIBUTION

Scientific contribution
Development of a Hand-Crafted Functional Safety Dataset.
Agentic System Architecture Aligned with the V-Model for safety.
Custom Evaluation Metrics for Digital Safety Assistants.
Integration of Diverse Data and Multi-LLM Systems.

Economic contribution
Support for in Automated Safety Task Execution.
Certification-Level Performance – reducing time and resources.
Scalable Automation of PLC Test Code Generation.
Reduction in Safety Documentation Overhead.

SYSTEM ARCHITECTURE

An **agentic** system architecture structured around the V-model lifecycle phases, specifically tailored for safety-critical system development. The project further explores the integration of diverse data sources, heterogeneous data formats, and multiple large language models.

Digital Safety Assistant:

- General safety standard knowledge (IEC 62061, ISO 13849-1, etc.).
- Official functional safety certification exam passing with 70% correctness

Automated Testing Assistant:

- Generating TestSuite test code for testing PLC code
- Input is prompt from human.
- PLC test code generated with 93% correctness

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