PROFESSIONAL PROFILE

Roman Frank Starbek

Dipl.-Ing. (FH), Model-based Product & Controls Design

Core Skills

- Model-Based Development (MATLAB/Simulink/Stateflow)
- Control Systems & Mechatronic System Design
- System Architecture & Algorithm Development
- Testing & Validation (X-in-the-Loop)
- Real-Time (Embedded) Systems & Rapid Control Prototyping
- Production Code Generation & Optimization

Senior engineer specialized in model-based development for mechatronic systems.
25+ years of experience across automotive, energy, and industrial systems.
Strong background in vehicle dynamics, heat pump control, and fuel cell systems. Combines system architecture expertise with hands-on implementation from concept to realization.
Background in mechanical engineering, with experience from CAD to manufacturing and assembly.

What I Help With

- Stabilizing complex control systems
- Turning concepts and prototypes into production-ready solutions
- Integrating mechanics, electronics, and software into robust systems
- Improving system performance, reliability, and maintainability
- Structuring and simplifying complex or legacy development environments
- Supporting teams from concept, validation, and commissioning phases

Education

1999 - 2001
Cologne Laboratory of Mechatronics
Research Assistant

1994 - 1999
Cologne University of Applied Sciences
Mechanical Engineering

1990 - 1993
German Apprenticeship System
Certified Industrial Mechanic

Selected Experience

2026 - present
Vitli Krpan
Project Manager

2018 - 2026
designXtronics
Independent Consultant
Model-based development, control systems, consulting, tool development

2015 – 2018
Vaillant Group
Technology Advisor
Model-based control systems engineering for heat pumps and energy systems

2002 – 2015
GIGATRONIK
Team Leader / Department Leader
Automotive component development, simulation & system integration

2001 – 2002
Mercedes-Benz Steering Systems
Development Engineer
Electric power assisted steering systems (EPAS)

Languages

German
English
Slovenian

Tools

MATLAB/Simulink/Stateflow - dSPACE Hardware, ControlDesk, TargetLink - CANape - C/C++/Java/Kotlin/Python - CATIA

Standards

PRINCE2 Project Management - AUTOSAR - ASPICE Assessor - ISO/IEC 15504, ISO/IEC/IEEE 12207, EN ISO 13849, ISO 9001 - Requirements Engineering

SELECTED PROJECTS - Vehicle Control: From Assistance to Autonomy

Chassis Control Coordinator for Autonomous Driving - Tier-1 (Confidential) (2019–2020)

Context & Challenge

Development of longitudinal control algorithms for autonomous driving systems.
Coordination of multiple control modes (drive, stop, start, standstill) with smooth transitions and safety constraints.

Solution

- Design of modular Simulink architecture for longitudinal controllers
- Development of smooth switching and filtering mechanisms
- Creation of MATLAB GUI for trajectory generation and analysis
- Development of automated unit testing framework

Outcome

Stable and scalable longitudinal control modules enabling reliable series autonomous driving development.

Technologies

MATLAB/Simulink/Stateflow,
dSPACE TargetLink
DOORS, Jira, Git

Electric Power Steering Control System – Mercedes-Benz (2001–2002)

Context & Challenge

Development of next-generation EPAS systems under strict safety and stability requirements.
Unstable steering behavior and complex electromechanical dynamics.

Solution

- Physical modeling of steering mechanics and electric motors
- Model parameter identification
- Design of advanced control algorithms (LQG, observer-based control) and parameter calibration
- Automatic generation of production-ready embedded code
- Validation in test vehicles

Outcome

Robust and validated steering control software enabling reliable industrial operation.

Technologies

MATLAB/Simulink/Stateflow,
dSPACE AutoBox, ControlDesk,
TargetLink (Fixed-Point Code Generation)

SELECTED PROJECTS - Energy Systems: End-to-End Delivery

400 kW Fuel Cell Control System – Globe Fuel Cell Systems (2022–2024)

Context & Challenge

Development of complete simulation architecture and control modules for fuel cell systems and integration on test bench.
Complex interaction of cooling, cathode, anode, and power systems with high reliability requirements.

Solution

- Design of modular simulation environment for system components
- Development and implementation of plant and controller models
- Parameter identification and model calibration
- Integration with test benches and HMI systems
- Commissioning and optimization on module and system level

Outcome

Validated fuel cell control software as golden sample for industrialization

Technologies

MATLAB/Simulink/Stateflow, ETAS HIL hardware & INCA, Git

Heat Pump RCP Test Bench – Vaillant (2015–2018)

Context & Challenge

Rapid Control Prototyping (RCP) platform for heat pump refrigerant circuits.
Flexible testing environment to develop and validate complex control algorithms.

Solution

- Specification of system requirements and interfaces
- Selection and integration of sensors, actuators, and real-time hardware
- Development of generic control architecture & modularized software
- Commissioning and optimization of test bench operation

Outcome

High-performance test platform enabling faster development cycles with significant reduction of series calibration parameters.

Technologies

MATLAB/Simulink/Stateflow, dSPACE MicroLabBox & ControlDesk

SELECTED PROJECTS - Product Development: From Concept to Realization

Functional Safety Controller – GLOBE Fuel Cell Systems (2024–2025)

Context & Challenge

Development of safety-critical control software for industrial fuel cell systems in compliance with functional safety standards.
Ensuring deterministic and fully verifiable behavior of safety functions under all operating and fault conditions, while meeting ISO 13849 requirements.

Solution

- Analysis and formalization of safety requirements using standardized patterns
- Consistency and completeness verification with automated tools
- Automatic generation of safety software units from formalized requirements
- Design of safety-oriented application software architecture
- Development of reproducible MIL-based regression test suites
- Automated generation of verification and compliance reports
- Process documentation aligned to ISO 13849

Outcome

100 % verified safety control module with complete traceability from requirements to validated software units fulfilling ISO norms.

Technologies

MATLAB/Simulink/Stateflow,
Requirements Verifier,
Model Tester,
Git

Saddle Pressure Measurement System – designXtronics (2020–2025)

Context & Challenge

Development of an electronic measurement system for biomechanical analysis in equestrian sports.
Reliable measurement and evaluation of dynamic saddle pressure and biomechanic motion under real riding conditions.

Solution

- Design of sensor inlays and embedded electronics
- Development of PCB and data acquisition firmware
- Implementation of IMU-based motion analysis and Machine-learning-based gait detection
- Android application for real-time visualization and analytics
- Calibration test bench for sensor validation

Outcome

Fully functional and field-tested prototype system with professional users.

Technologies

Embedded C/C++,
Arduino nano 33 (Cortex M4F),
Bluetooth Low Energy,
MATLAB/Simulink/Stateflow,
Android (Java), SQLite