

Concept and Pilot Implementation of a Digital Twin for the Formula Student Electric Vehicle Using 3DEXPERIENCE

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Formula Student (FS)

The internationally highly regarded engineering competition Formula Student (FS) challenges teams of students to design and build a formula racing car and compete against other universities in various disciplines. The various competitions offer an exceptional opportunity for students to apply their academic knowledge in a practical setting.

Introduction Bachelor-Thesis

The concept of a Digital Twin, a virtual representation of a physical system, is becoming increasingly important in engineering for simulation, validation, and data-driven design. In the context of the Formula Student Electric Vehicle, a digital twin would enable a more integrated development process, combining CAD, simulation, and testing within a unified digital environment.

In the long term, the goal of the Zurich UAS Racing Team is to develop a comprehensive digital twin of the entire race car within the 3DEXPERIENCE platform. As a first step toward this vision, this Bachelor Thesis serves as a pilot project, focusing on the digital twin of a single wheel assembly including suspension components.

The project emphasizes research, concept development, and digital implementation, laying the groundwork for a scalable digital twin architecture and defining the infrastructure and processes required for future expansion to the full vehicle model.

Goal

The goal of this project is to investigate and develop the foundational concepts and methodologies required for creating a digital twin of the Formula Student Electric Vehicle within 3DEXPERIENCE.

As a pilot implementation, the thesis will focus on one wheel and suspension assembly, including the digital modelling, data management, and integration strategy.

The outcome will provide validated concepts, infrastructure recommendations, and a functioning pilot digital twin, serving as the basis for expanding the approach to the complete car over the next development cycles.

Objectives:

- **Research and Analysis:** Investigate the principles of digital twin technology and its applications in motorsport and automotive engineering.
- **Platform Evaluation:** Analyse the capabilities of the 3DEXPERIENCE environment for CAD, simulation, and data integration.
- **Infrastructure Planning:** Define the required infrastructure, data flow, and interfaces for managing the digital twin environment.
- **Concept Development:** Develop conceptual structures and workflows for modelling and maintaining the digital twin of the Formula Student vehicle.

- **Pilot Implementation:** Create a digital twin of one wheel and suspension assembly as a demonstrator.
- **Documentation and Outlook:** Document the findings, challenges, and recommendations for scaling the approach to a full vehicle model in future projects.

If you are interested in this project thesis, we kindly ask you to get in touch with us:

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