



Integrity of Virtual Testing Procedures

Advisor: **Maria Eichlseder, Corina Klug (VSI)**

Motivation

This is a collaboration with the *Vehicle Safety Institute VSI*.

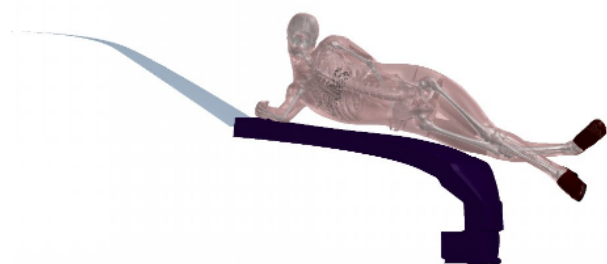
In virtual testing of *car safety*, accidents are simulated with software packages such as LS-DYNA. This has many advantages: Simulations can be repeated with different human models (instead of only one standard dummy) and different accident scenarios (instead of a single laboratory loadcase). This simulation involves complex FE (finite elements) models of *car parts* as well as the *human body*. These models are developed by different stakeholders in the process, such as the vehicle manufacturers. They need to be individually evaluated to make sure they conform to the physical behaviour and can later be re-used for many testing scenarios. It is essential to assert the integrity of these models and simulation results to prevent mistakes or “cheating”.

At VSI, TU Graz, a procedure was developed to certify the Human Body Models. This was implemented by Euro NCAP and has led to an improved trust in results.

Your goal in this thesis is to work with us on a procedure to verify that simulation files cannot be manipulated throughout the process and that simulation results can be directly linked to simulation files. This should be done by signing simulation files after their certification.

Goals and Tasks

- > Get familiar with the LS-DYNA toolchain
- > Understand the process and describe attack scenarios
- > Explore cryptographic solutions to ensure integrity
- > Implement your ideas as plugins or additional scripts



Pedestrian impact scenario

Literature

- > **LSTC**
LS-DYNA simulation software package
<https://en.wikipedia.org/wiki/LS-DYNA>
- > **Euro NCAP**
Pedestrian Human Model Certification
<https://cdn.euroncap.com/media/41783/tb-024-pedestrian-human-model-certification-v11.201811141155007002.pdf>
- > **Linder et al.**
Virtual Testing and Open Source Human Body Modelling
<http://www.ircobi.org/wordpress/downloads/virtual-testing-workshop-2019.pdf>
- > **C. Klug et al.**
Development of a Certification Procedure for Numerical Pedestrian Models
The 26th ESV Conference Proceedings
<http://indexsmart.mirasmart.com/26esv/PDFfiles/26ESV-000310.pdf>

Recommended if you're studying

CS ICE SEM

Prerequisites

- > Interest in applied crypto and secure applications

Advisor / Contact

maria.eichlseder@iaik.tugraz.at,
corina.klug@tugraz.at