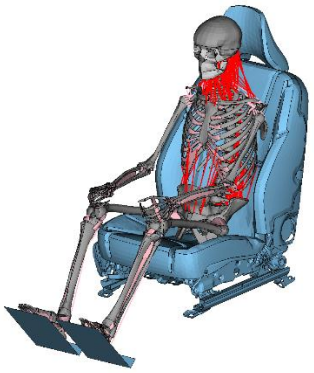
OPTIMIZATION OF MUSCLE CONTROLLERS FOR AN ACTIVE FINITE ELEMENT HUMAN BODY MODEL



Today, development of safe vehicles is a virtual process almost exclusively based on explicit finite element (FE) simulations. Crash test dummies are being replaced by Finite Element Human Body Models (HBMs). These are tools which can be used to simulate the detailed pre- and in-crash occupant response. To model the pre-crash response, such as panic braking or evasive steering, the HBMs have been fitted with active muscle controllers and can as such be tuned towards different behaviors. A common approach is to tune these models towards the human kinematic and muscular response recorded in sled or maneuvering experiments with volunteers. One model, available within the SAFER consortium, has recently been fitted with a muscle controller capable of responding to vehicle maneuvers such as braking and steering, but has not been tuned for that purpose.

OBJECTIVE

> The aim of this project is to tune the muscle controller gains of the finite element human body model SAFER-THUMS towards a set of volunteer experiments using optimization tools. A second aim is to validate the model towards another set of volunteer experiments.

METHOD

> The project will start with a literature review of optimization methods, to serve as input for the controller gain tuning. The students will set up and execute several FE simulation optimizations within the LS-Opt software. After the optimization loop is performed, the model will be validated against a set of volunteer experiments.

LEARNING OUTCOMES

> The student(s) will learn and develop skills in numerical optimization methods as well as in explicit finite element simulations for vehicle safety using a human body model.

SUPERVISOR

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