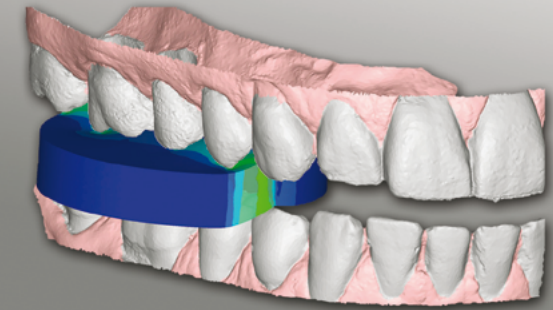


## VIRTUAL ORTHOPEDIC LAB



### FACTS

Development of innovative orthopedic products often entails strict control measures and extensive experimental tests before being commercially available. When a product prototype fails an experimental test, it has to be re-designed and re-tested, which often costs time and money. The “Virtual Orthopedic Lab” aims to create a virtual environment, where such experimental tests can be simulated. This increases the chance that the product passes the laboratory tests.

Current orthopedic products in the market are available off-the-shelf and are not necessarily custom-made.

For example, the current ISO standards test the stability and durability of an orthopedic product for an average user. With the help of computer simulations, loading conditions specific to a subject, can be additionally tested in order to ensure the applicability of the product to this subject.

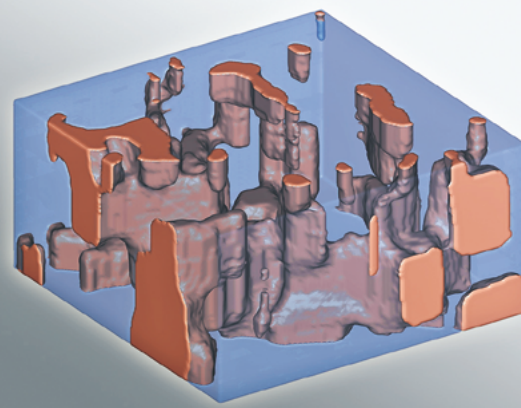
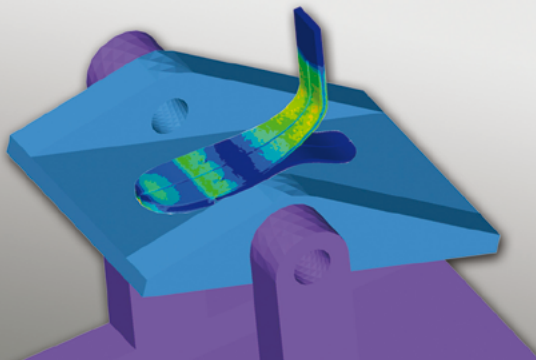
### OUR COMPETENCIES

The workgroup (computer-assisted) biomechanics supports the biomedical industry in research and development of biomedical products. The goal of the “Virtual Orthopedic Lab” is the development of a workflow-based simulation environment for virtual product development and research in orthopedics.

Fraunhofer IPA, in cooperation with the Excellence Cluster “Simulation Technology” at the University of Stuttgart, forms an ideal ground in the field of biomechanics for an inter-disciplinary research with its infrastructure and industrial contacts. Such a close proximity aids in quick knowledge transfer from both partners offering a unique competence in the field of virtual testing and development of orthopedic products (exo- and endoprotheses).

### Dental technology

One of our core competence areas is in the field of dental technology. This includes simulation of biting forces as well as stress analysis of dental products.



We focus on the modeling and simulation of chewing apparatus, especially on the motion analysis of jaws and in the calculation of biting forces. Such an investigation would then yield the required input parameters for future applications in the field of dental implants, surgical planning, dental technology, food industry, etc. A chewing robot is also available at Fraunhofer IPA to determine the chewing characteristics of different types of food. This chewing robot can be fitted with different dental implants and dentures, which can then be experimented using any arbitrary chewing motion.

### **Prostheses test and development**

Simulated tests on virtual prototypes can efficiently accelerate the development process. In the field of "Prostheses test and development", we develop simulation models for predicting the loads and stresses on a prosthesis during amputee gait. The prosthesis would be subjected to simulated stress-strain tests, which would make the usually comprehensive experimental tests redundant, thereby achieving substantial efficiency and speed in the development process.

### **YOUR BENEFIT**

The "Virtual Orthopedic Lab" develops a transparent simulation-assisted workflow to accelerate and simplify the otherwise time-consuming product development process for orthopedic engineering by:

- Studying biomechanical performance of various designs (e.g., prostheses or implants) through computer simulations
- Analyzing and validating various design alternatives and loading scenarios in a short time
- Detecting potential problems early and resolving them

The result is a flexible simulation tool that offers the following advantages:

- Easy and intuitive use
- Platform-independent tool that can be used on a web browser
- Direct connection to other applications (motion capture, simulation software, CAD/CAM systems) through customized workflow
- Customizable to customer needs
- Standardized virtual tests e.g., ISO 22675

### **KONTAKT**

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