Vorlesungsverzeichnis

M.Sc. Digital Engineering

Sommer 2020

Stand 12.11.2020

M.Sc. Digital Engineering **3**

M.Sc. Digital Engineering

Das aktuelle Kursangebot für den Studiengang „Digital Engineering” finden Sie im Veranstaltungsverzeichnis, unter „Fakultät Medien”. Zum Kursangebot

The current course offer for the degree programme ”Digital Engineering” can be found at the course catalogue, under ”Faculty of Media”. Course catalogue

301015 Interpolation with solutions of partial differential equations

K. Gürlebeck, S. Bock Veranst. SWS: 10
Projekt

Beschreibung

Modern measuring methods, such as terrestrial laser scanning techniques or photogrammetric methods, enable the high-precision detection of deformed component surfaces by using a large number of spatial measuring points. This results in the problem of reconstructing the displacement field and the stresses in the interior of the component on the basis of the discrete measured values on the surface. To this end, the project aims to develop multivariate interpolation methods with solutions of partial differential equations (Laplace equation, Lamé-Navier equation). Furthermore, these methods are to be implemented prototypically and evaluated for simple domains.

Voraussetzungen

- Successful completion of the modules
  o Applied Mathematics & Stochastics
  o Advanced Modelling – Calculation / CAE Good
- knowledge of programming, especially the implementation of mathematical algorithms
- Experienced in the use of mathematical calculation software (Matlab, Octave, Maple o.a.)

302010 Development and validation of an algorithm to analyze schlieren images

C. Völker, V. Rodehorst Veranst. SWS: 10
Projekt

Beschreibung

Schlieren imaging system is a flow visualizing technique. It is used to visualize density variation in transparent media. Schlieren imaging capitalizes the refraction of light. It makes small density gradients (e.g. weak gradients of refractive index found in indoor air) visible. For this project, the schlieren imaging system at the Department of Building Physics will be used. The setup consists of four elements, (1) single concave spherical mirror, (2) LED light source, (3) knife-edge and (4) a digital camera. The setup will be used to capture schlieren images. Large time-sequence of these images would be analyzed using digital cross-correlation algorithm to quantify the velocity, temperature, density gradient, refractive index, etc. of the test object.

Voraussetzungen

- Successful completion of Image Processing and Computer Vision.
- Simulation Methods in Engineering (additional)

303010 Virtual Mechanics Lab

C. Koch, J. Krischler Veranst. SWS: 10
Projekt

Beschreibung

AR and VR offer excellent opportunities for integration into university teaching for engineers because they address human image processing. Image processing supports the human mind in forming a mental model, i.e. in forming a deep understanding of the subject matter. A good learning scenario must include fixed learning goals that are to be achieved by completing the AR/VR app. The learning scenario must be implemented in a visually appealing way and in consideration of psychological concepts. Implementation requires not only an understanding of the concepts to be implemented, but also the ability to implement them in the respective programs.

Voraussetzungen
- Knowledge in Unity (optional)
- Knowledge in programming (Python or C#)
- Knowledge in visual scripting (e.g. Dynamo, Grasshopper) (optional)
- Advanced knowledge in mechanics

303011 Collaborative BIM Platform

C. Koch, M. Artus Veranst. SWS: 10
Projekt

Beschreibung

The whole process of construction is based on a building information model. Multiple actors with different jobs and hence different rights, views and documents work on a single project. We want to merge the model and related documents in a single system for teaching purposes. Basic open software already exists. To implement and test an advanced overlay and communication is the goal of the project.

Voraussetzungen
- programming knowledge (object-oriented modeling and programming or similar)
- knowledge in Building Information Modeling (Advanced BIM or similar)
- Web technologies (REST, JSON, Server, Client, ...)

303012 Virtual Bridge Inspection

C. Koch, M. Artus Veranst. SWS: 10
Projekt

Beschreibung

It is possible to capture current bridge condition via unmanned aerial systems. However, it is still necessary to assess the data by an engineer. A combination of both, on side inspection by drones and assessment in office by an engineer, we want you to implement and validate a virtual bridge inspection environment. First, loading the bridge data into unity. Afther that, the engineer shall be able to add damages to the bridge and finally export the data again.

Voraussetzungen
- programming knowledge (object-oriented modeling and programming or similar)
- knowledge in Building Information Modeling (Advanced BIM or similar)

- Optional: Knowledge in Unity and C#

401009 Experimental structural dynamics and Structural monitoring (P)

V. Zabel Veranst. SWS: 4
Projekt
Di, wöch., 07:30 - 12:30, Marienstraße 7 B - Projektraum 301

Beschreibung

The students obtain deepened knowledge in structural dynamics, structural dynamic analysis, data processing, dynamic test equipment and its handling. They learn to analyse the dynamic behaviour of a structure utilizing both numerical and experimental state-of-the-art methods. Furthermore, the students have to develop strategies and concepts of investigation. The work in small groups enhances the social competence of the students.

Operational modal analysis, sensor types, sensor positioning, data analysis and assessment, assessment of structural changes, structural modelling, model updating

Bemerkung

14 students from NHRE only

Voraussetzungen

Structural dynamics

Leistungsnachweis

1 Project report + intermediate and final presentations

„ Experimental structural dynamics”

(100%) / **SuSe**

401021 Development of a software tool for a 2D structural frame analysis

C. Könke, A. Habtemariam Veranst. SWS: 10
Projekt

Beschreibung

The project is to develop a software tool which can assess the behavior of a simple 2D frame structure and compute stepwise and interactively the internal forces using different solution techniques such as nodal equilibrium method, flexibility method and stiffness method.

The program should include a Graphical User Interface (GUI), which allows the user to intuitively define an input, presents detailed solution steps for checking manual hand calculations and plots the internal forces and displacements.

Voraussetzungen
- programming knowledge in Octave or MATLAB or Maple
- knowledge in Structural Mechanics
- basics of Finite Element Methods

901716 Implementation and validation of a shake table for structural health monitoring and control

K. Smarsly, S. Ibañez Sánchez Veranst. SWS: 10
Projekt

Beschreibung

Design of civil infrastructure involve assumptions of material characteristics, assumption of loading conditions, and assumptions of structural behavior. However, some uncertainties regarding structural behavior can be reduced by using scaled models. In the case of earthquake engineering, knowing the structural behavior under seismic events allow engineers to improve models and produce more accurate designs. In this context, shake tables are used for scaling and simulating earthquakes in scaled models. However, shake tables are usually expensive and difficult to operate. The proposed project is centered around shake tables. The main objective of this project is to produce a low-cost shake table able to simulate earthquake events for scaled structures. The implementation of the shake table involves several steps: - Elaborate a literature review regarding low-costs shaking tables - Summarize the scaling process of earthquake movements - Elaborate a budget of the materials needed for creating a shaking table - Create the shaking table - Program the shaking table for reproducing scaled earthquakes based on input text files with earthquake records The outcome of the project will be a low-cost shake table able to reproduce scaled earthquakes for any scaled structure. A real-time evaluation of the produce earthquake should be accomplished by measuring the movement of the shake table using accelerometers and deviations of the movement should automatically corrected by the shake table. In parallel to the special project, attendance to the ”Scientific working in computational engineering” lecture is compulsory. The basics concepts required for working and documenting scientific works will be obtained during the lecture. Integrated lecturesIntegrated

Voraussetzungen
- Programming skills
- Basics of earthquake engineering
- Basic knowledge on scientific writing

Exam: Advanced modelling - calculation/CAE (301013)

K. Gürlebeck
Prüfung
Di, Einzel, 08:00 - 09:00, Final examinationThe exam will take place in the "Weimarhalle" - Main building. Row 13 to 15 » Guidance note for examination in the Weimarhalle, 04.08.2020 - 04.08.2020

Exam: Introduction to Optimization / Optimization in Applications (451002+451006)

T. Lahmer
Prüfung
Fr, Einzel, 09:00 - 11:00, Final examinationThe exam will take place in the "Weimarhalle" - Main building. whole hall » Guidance note for examination in the Weimarhalle, 31.07.2020 - 31.07.2020

Bemerkung

Final examination
The exam will take place in the "Weimarhalle" - Main building.
Further and more detailed information will be available before the exam period.

Exam: Modelling of steel structures and numerical simulation (205007)

M. Kraus
Prüfung
Mi, Einzel, 09:00 - 11:00, Final examinationThe exam will take place in the "Weimarhalle" - Main building. Row 1 to 10 » Guidance note for examination in the Weimarhalle, 12.08.2020 - 12.08.2020

Bemerkung

Exam: Stochastic Simulation Techniques and Structural Reliability (2451007)

T. Lahmer

Prüfung

Di, Einzel, 08:00 - 10:00, Final examinationThe exam will take place in the "Weimarhalle" - Main building. Row 1 to 7 » Guidance note for examination in the Weimarhalle, 04.08.2020 - 04.08.2020