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Universität Innsbruck
Institut für Grundlagen der Technischen Wissenschaften
Arbeitsbereich für Angewandte Mechanik

Masterarbeit:

Seismic assessment of mid-rise steel frame structures through extensive time history analyses

The **seismic behaviour** of the **structures** in an urban environment is largely formulating its safety, environmental and economic footprint. The reaction of a structure to an earthquake is usually examined in the ability to withstand the event without collapsing, affecting primarily the safety of life, but is also examined in terms of damages and economic losses. An increasing interest in the engineering community lies in the way in which the seismic behaviour of buildings is assessed. The time history analysis method is considered the most accurate approach, being typically used in research studies. Despite the increased requirements in terms of modeling and computational cost, it is gaining ground in engineering practice. An even more promising aspect (in the center of engineering interest) is the utilization of **large datasets**, in the era where **machine learning** and **artificial intelligence** are ever-growing to sidestep computationally inefficient methods.

This master thesis will focus on expanding and completing a large database of **Incremental Dynamic Analysis** (IDA), performed in code conforming planar 2D steel frames of 8, 12 and 20 storeys. The results of these analyses will form a large database of **seismic responses** regarding displacements and accelerations of the structures under seismic excitation ranging from linear to collapse. The resulting database will be assessed through **data analytics** to reveal trends and metrics regarding two distinct limit states: the yielding and collapse phase. These information along with the database will be powerful information regarding mid-rise steel frames, ideal as a starting point to apply machine learning techniques.

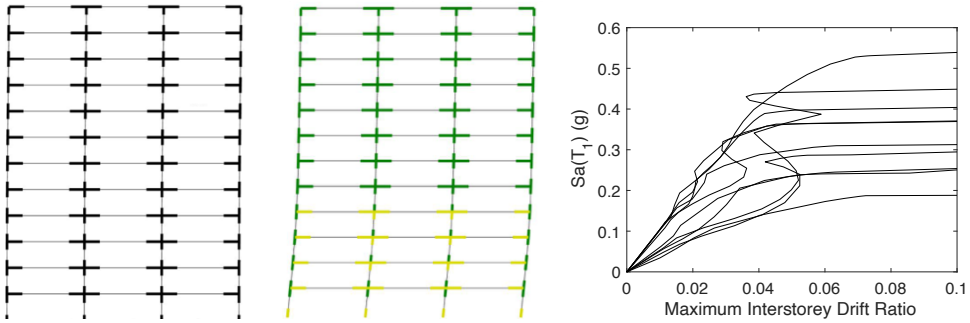

Figure 1. The 12-storey frame model (left), maximum deformation state with stresses of a time history analysis (centre) and IDA results of 10 ground motion records (right).

An ideal candidate for this project would have a strong interest in structural dynamics and earthquake engineering and is excited about doing research. The structural analyses will be performed through the software OpenSees using a Matlab-based toolbox that is already developed at the Unit of Applied Mechanics to accommodate them and Matlab will be used to process the results and perform data analytics to the developed database. Therefore the ideal candidate will work primarily with Matlab, hence experience with the software is necessary, while experience with OpenSees will also be helpful.

- **Contact:**

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