

Implementation of an Efficient Coupled FEM-SBFEM Approach for Soil-Structure-Interaction Analysis

Marco Schauer*, Sabine Langer†

* Technische Universität Braunschweig
Institut für Statik
Beethovenstraße 51, 38106 Braunschweig, Germany
e-mail: m.schauer@tu-braunschweig.de, web page: <https://www.tu-braunschweig.de/statik>

† Technische Universität Braunschweig
Institut für Konstruktionstechnik
Langer Kamp 8, 38106 Braunschweig, Germany
e-mail: s.langer@tu-braunschweig.de, web page: <https://www.tu-braunschweig.de/ik>

ABSTRACT

Buildings are grounded in the surrounding soil, so that soil and structure interact with each other. Consequently in the soil induced vibrations are transmitted to the structures. Neighbouring buildings and structures interact with each other, as they are connected by the soil. Nowadays numerical simulation of soil structure interaction is of great interest and is applied to very different problems. These include for example the construction of reliable earthquake-resistant structures in seismic active areas, and also the increase the comfort of Buildings by decouple them form surrounding emissions like vibrations induced by traffic of machine foundations.

This work shows that the simulation of soil-structure-interaction taking unbounded domains into account, which fulfils the Sommerfeld radiation condition exactly, is not only possible for academic examples, but for large scale real life problems as well. Therefore two numerical methods were coupled to create an efficient coupled method, which can be used to simulate soil-structure-interaction in time domain. The numerical implementation of this coupled approach bases on a combination of finite element method[1] and scaled boundary finite element method[2]. The finite element method is used to discretise the near field, containing structures and its surrounding soil. The coupled infinite half-space the so called far field is realised by the scaled boundary finite element method.

A contemporary parallel implementation of the coupling algorithms is done, since the simulation of soil structure interaction in time domain is very time and memory consuming a contemporary parallel implementation of the coupling algorithms is done[3]. Subsequent the numerical performance of the implemented software is discussed in terms of speed-up and efficiency. And different geotechnical applications are illustrated and the applicability of the coupled method is shown and discussed on chosen examples.

REFERENCES

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