RUHR-UNIVERSITÄT BOCHUM

Master‘s Thesis

Topic:

Determination of the geometry of foundation plates using wave propagation

DESCRIPTION:

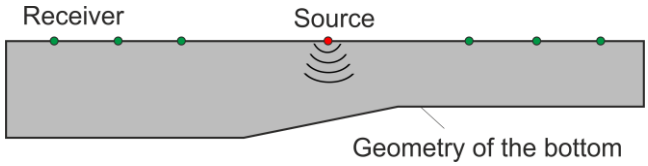
During the construction of new buildings, existing structures – including foundation plates – are usually demolished entirely. The crushed concrete is, if at all, reused as bulk material in road construction, even though many of the load-bearing components remain intact. The Collaborative Research Centre 1683 investigates how buildings can be modularly dismantled and how structural elements, including the foundation plate, can be effectively reused.

Before foundation plates can be reused, their structural integrity must be evaluated. Initially, the geometry of the foundation must be determined, followed by an analysis of the internal condition. The goal of this master's thesis is the **determination of the geometry of the foundation plate using wave propagation methods**.

In a (synthetic) experiment, seismic sources and receivers are placed on the foundation plate. After excitation with elastic waves, the resulting time-dependent displacements are measured at the receivers. These displacements provide information about the foundation’s geometry. To interpret this information, a parameterized simulation model capturing various geometries is created. An optimization method then adjusts the model parameters until the simulated displacements closely match the measured ones.

The thesis will investigate various approaches for **parametrization** and **optimization** in order to identify the most suitable method. The aim is to develop a hybrid method, combining advantages of multiple techniques. Additionally, the necessity of including the foundation’s reinforcement in the simulation will be analyzed.

REQUIRED EXPERIENCE:
Programming in Python
Familiarity with Linux



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