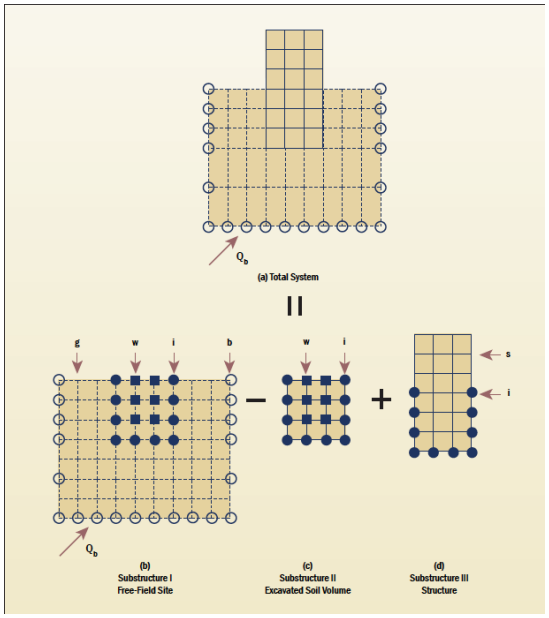
Improving Computation Efficiency of A Dynamic Soil-Structure Interaction Analysis Program

A computer program named SASSI is widely used for dynamic analysis of soil-structure (SSI) interaction (earthquake excitation and forced vibration). It has become a standard tool for analysis of nuclear facilities in the US.



(from Bechtel 2008)

SASSI is formulated based on a substructure approach. It treats the total soil-structure system as a superposition of 3 substructures: a semi-infinite subsurface domain, an excavated domain of the subsurface, and the structure. The system matrices (stiffness and mass matrices) of the total system are obtained by subtracting those for the excavated soil from the impedance matrix corresponding to the interaction nodes in the semi-infinite subsurface and adding those for the structures.

SASSI's computational need is intense, especially in using direct Gaussian elimination to invert a full matrix to obtain the impedance matrix of the subsurface and to solve the total system of equations. In this software lab project, the students will become acquainted with dynamic SSI analysis. They will subsequently add additional equation solvers to replace the inefficient direct equation solver. If the project progresses efficiently, the students will implement equivalent linear iteration to account for nonlinear soil behaviour and to apply the program to solve random vibration problems.

Supervisors

Dr. Chin Man Mok, AMEC Geomatrix, bill.mok@amec.com
Iason Papaioannou, Engineering Risk Analysis, iason.papaioannou@tum.de
Prof. Daniel Straub, Engineering Risk Analysis, straub@tum.de

References

[1] SASSI manuals.