Fast Direct Solvers for Scattering Problems

During the last several years, iterative algorithms for the solution of large-scale scattering problems have achieved a certain degree of maturity; with some help from Moore's law, construction of such schemes is becoming a development (rather than research) activity. The existing techniques (and their straightforward extensions) provide satisfactory treatment for many classes of scattering problems.

On the other hand, in certain environments (often associated with physical systems close to resonance), iterative techniques are inherently inefficient; the so-called cavity problem in the modeling of electromagnetic scattering is a well-known environment of this type. In such cases, the existing numerical armamentarium leaves much to be desired.

In this talk, I will discuss the possibility of fast direct (as opposed to iterative) methods for the numerical solution of scattering problems; several rudimentary schemes will be discussed, and preliminary results demonstrated.