Scalability of normal modes computation in SunShine using MUMPS solver

Jason PAVLIDIS

Moduleering, Greece

Abstract

The normal modes of a structure are computed from the solution of the symmetric generalized eigenproblem of stiffness and mass matrices. In large sparse models, the *Lanczos* algorithm is a very powerful and robust tool for extracting some of the extreme eigenvalues. Using the variant of *shifted block Lanczos* algorithm, we can compute efficiently the natural frequencies and normal modes in a desired frequency range.

The LDL^T decomposition is a building block in the *shifted block Lanczos* algorithm and requires a significant portion of the overall execution time. A robust and efficient linear solver like *MUMPS* is crucial for the performance of the method.

In this presentation, we show the key features of *MUMPS* solver that are used in SunShine eigensolver and we highlight the effect of *MUMPS* scalability on the performance of the *shifted block Lanczos* algorithm when running on multicore systems. In addition, we note some challenges that we have faced when using its distributed features.