



Real time solution of parameterised problems via Model Reduction techniques

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Parameterised problems, in which the solution depends on space, time and a set of predefined parameters (e.g. material properties, boundary conditions, domain geometry, initial conditions, ...), can be solved with extremely high efficiency with Model Reduction techniques.

Among these techniques the Proper Generalized Decomposition (PGD), has some very interesting features that will be investigated and presented in this work. The PGD technique involves two computational phases: first, one "offline" phase that can be computationally expensive but it is executed only once in a lifetime and, second, an "online" phase that is extremely fast and lightweight in computer resources.

The possibilities of PGD are shown here via several example problems:

i) heat transport parameterised in the material properties, boundary conditions and interface locations, ii) Stokes flow parameterised in the geometry domain, and iii) wave propagation parameterised in boundary conditions, material properties and interface locations.

The extremely fast evaluation of PGD-solutions make them ideal to be used within inverse problems where the unknowns are the values of the parameters and the data consist in some partial observation of the solution field.