CHALLENGES AND ADVANCES IN THE ANALYSIS OF MULTIPHYSICS PROBLEMS

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Abstract. The finite element method, in a broad sense, has emerged to be the major tool for the analysis of multiphysics problems, in research and design. However, with this success, the demand for more powerful capabilities regarding analysis procedures has also greatly increased. In this presentation, we first summarize major challenges in the research and development of more powerful analysis procedures, and then we focus on advances that we have achieved to meet some of these challenges. We considerthe more reliable and accurate analysis of highly nonlinear shell problems involving large deformations and strains; the analysis of multi-physics structural problems fully-coupled to fluid flows, temperatures, and electro-magnetic fields; the simulation of wave propagation problems at different scales; and the analysis of proteins in biological engineering.

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