1038-65-36 **Pavel Solin*** (solin@utep.edu), 500 West University Avenue, El Paso, TX 79968, and **Jakub Cerveny** and **Lenka Dubcova**. *Adaptive Finite Element Methods for Multiphysics Coupled Problems.* Preliminary report.

Our work is related to the design and analysis of automatic adaptive algorithms for multiphysics coupled problems described by systems of (generally time-dependent) PDEs. Interacting physical fields may exhibit large qualitative and quantitative differences, and thus approximating all of them on the same finite element mesh may be highly inefficient. Therefore, we approximate all physical quantities on individual meshes which moreover are equipped with independent adaptivity mechanisms. The idea of using different meshes is not new, but so far it has been used mainly in the context of various operator-splitting schemes (the work of Don Estep's group and others). However, since operator splitting techniques often destroy a lot of valuable information, and in particular information useful for error estimation and automatic adaptivity, we focus on monolithically coupled models. In this talk, we give a brief description of the multi-mesh hp-FEM, show applications to selected coupled problems, and discuss recent progress in open problems related to error estimation and automatic adaptivity. We will present a new approach to automatic adaptivity for time-dependent problems based on the multi-mesh FEM that performs simultaneous mesh refinement and coarsening naturally. (Received January 09, 2008)