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INNOVATIVE NUMERICAL APPROACHES FOR MULTI-PHYSICS PROBLEMS

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ABSTRACT

The focus of the mini-symposium is on novel computational approaches for the analysis of multi-physics problems. Typically, advanced applications in the field of mechanics require the solution of coupled problems. In particular, we are thinking of problems where it is necessary to consider the coupling of temperature, electric fields, magnetic fields, chemical potentials, solids and fluids. Although from the engineering point of view we are interested mainly in problems and in their solutions, in this mini-symposium we would like to collect researchers that are developing methods for the analysis of advanced coupled problems and willing to share their ideas and their experience with others. We would like to describe the solution techniques more than the physical problems, in order to innovative spread ideas that can be fruitfully applied to different coupled problems. For example, we look at approximation methods of the field variables, in terms of non-standard shape functions (nonlocal, meshfree, B-spline, iso-geometry, subdivision...). Approaches able to conceal smoothly different length scales will be especially appreciated. We will aim to see and discuss approaches that propose or use multi-scale integration procedures, able to deal with fast and slow times reducing the integration error and robust enough to avoid numerical instabilities.We would like to assess the appeal and robustness of innovative or alternative discretization methods with respect to the classic finite element approaches.
We wish to have scientists and researchers describing their innovative work on:

- Thermo-mechanics and visco-thermo-mechanics;
- Magneto-Electro-mechanics;
- Fluid-structure interaction;
- Saturated and partially saturated porous media;
- Muscle and heart biomechanics;
- Active and piezo-electric elastomers.