Sensitivity computation for a system of weakly coupled PDEs

Rolling tire mechanics yields complex problems with large deformations, non-linear, incompressible materials, and contact. It has been nonetheless simulated with success for years using finite element analysis. Tire design requires finding the right design parameters to enhance rolling properties such as rolling resistance. It is usually solved by an optimization loop, whether automated or with a human designer. Computing the sensitivity of properties of interest is key in improving the process. In our talk we will demonstrate how to take into account weak coupling between the 3D large deformation problem on a fast time scale, and the associated 2D-axisymmetric heat diffusion problem, on a slower time scale, in order to compute the sensitivity of rolling resistance with respect to material properties.