Title: Phase field models of grain boundary motions with dynamic boundary conditions

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Abstract: In this talk, we consider a class of nonlinear systems, which are based on a phase-field model of grain boundary motion, proposed by [Kobayashi et al.; Phys. D 140 (2000), 141–150]. Each system consists of: a parabolic PDE with nonsmooth perturbation; and an interior-boundary transmission system of a weighted singular diffusion equation and the corresponding dynamic boundary condition. The objective of this study is to obtain an enhanced mathematical method for grain boundary motion that enable to handle more complex interactions, as in the dynamic boundary conditions. On this basis, we largely classify our systems in regular and singular cases, and focus on similarities/differences in the mathematical analyses under regular-singular situations. Consequently, the mathematical results concerned with: the qualitative properties of regular-singular systems; and the continuous associations from regular to singular ones; will be demonstrated by means of the approaches based on time-discretizations.