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A phase field system motivated by grain boundary motion with degeneracy

This study is a jointwork with Dr. Hiroshi Watanabe, Salesian Polytechnic, Japan. In this talk, a one-dimensional system of two parabolic type equations is considered. This system is based on a phase field model of grain boundary, proposed by Kobayashi-Warren-Carter [Physica D, 140 (2000), 141–150], and it is derived as a gradient flow of a governing energy, called free-energy. The two variables (unknowns) of the free-energy are respectively supposed to be the orientation order and the orientation angle of crystal. In the context, the equation for η is formulated as a heat equation with a measure-valued perturbation, and that for θ is formulated as a singular diffusion equation with unknown weights. The focus in this talk is on the degenerate case of the weight at the time-differential θ_t in this system. On that basis, the solvability and the energy-dissipation for this system will be discussed through observations by various approximation approaches.