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A PHASE FIELD SYSTEM RELATED TO A TUMOR GROWTH MODEL AND THE SLIDING MODE CONTROL PROBLEM

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The talk reports on a joint work with Gianni Gilardi, Gabriela Marinoschi and Elisabetta Rocca (see [1]). A diffuse interface tumor growth model [2, 3] coupling a viscous Cahn–Hilliard type equation for the phase variable with a reaction-diffusion equation for the nutrient is introduced and discussed. We are interested to the sliding mode control (SMC) problem. Well-posedness and some regularity properties are outlined for the state system modified by the state-feedback control law. Then, it is shown that the chosen SMC law forces the system to reach within finite time the sliding manifold, that is chosen in a way that the tumor phase remains constant in time.

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References

[1] P. Colli, G. Gilardi, G. Marinoschi, E. Rocca. (2017). *Sliding mode control for a phase field system related to tumor growth*, Appl. Math. Optim., DOI 10.1007/s0024 .

[2] H. Garcke, K.F. Lam, E. Sitka, V. Styles. (2016). *A Cahn–Hilliard–Darcy model for tumour growth with chemotaxis and active transport*, Math. Models Methods Appl. Sci., **26**, 1095–1148.

[3] A. Hawkins-Daarud, K.G. van der Zee, J.T. Oden. (2012). *Numerical simulation of a thermodynamically consistent four-species tumor growth model*, Int. J. Numer. Methods Biomed. Eng., **28**, 3–24.

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