The Local and Global Dynamics of Nonlocal Cancer Tumor Growth Model

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Abstract:
We present here, the investigation of a dynamical model of tumor growth with an immune responses. Consider mathematical analysis of the three dimen-sional system of convolution equations regarding to dissipativity, boundedness of solutions, invariance of non-negativity, local and global stability and the basins of attractions. These type models of population dynamics, consumption of re-sources by the individuals occurs at the same spatial location as reproduction and death. We assume in this work that the individual located at a point in the spatial domain can consume resources not only at that point but also at some neighboring region surrounding that point. Movement of the individuals to the nearby location occurs in a faster time scale compared to the movement from one location to the other one. Such type reaction-diffusion equations with the con-volution term is also used to explain the emergence and evolution of biological species and speciation were studied. We derive some features of behavior of the three-dimensional tumor growth models with nonlocal dynamics described in terms of densities of three cells populations: tumor cells, healthy host cells and e¤ector immune cells. We found suc cient conditions, under which trajectories from the positive domain of feasible initial conditions tend to one of equilibrium points. Here, cases of the small tumor mass equilibria-the healthy equilibrium point, the .death.equilibria have been examined. Biological implications of our results are discussed.

Keywords:
Cancer tumor model, Immune system, Stability of dynamical systems, attractors.