Ellipsoidal model of vascular tumor growth

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*Abstract*— There are many models for vascular tumor growth. Due to mathematical complexities, the shape of tumor should have sufficient symmetries which enable us to calculate at least the main features of the tumor growth in the model under investigation. One of well treated geometries is that of the sphere model of tumor growth. For this model there are plenty of research which simulate the growth behavior of a wide range of tumor types with various layer structure. The motivation for such a simple model is related to the fact that almost all types of tumors are small spheres in early stages of growth. However, as we know, most of tumors have deviations from sphere in the last stage of growth. This encourage us to model it by some ellipsoid which is a better choice of geometrical model. Mathematically said, this type of model is more realistic and more complicated when we solve the related differential equations. After finding numerical solution to the corresponding model we found that the model is capable of answering to standard questions relating to the tumor growth specially giving an exact criteria for a tumor to be malignant or not. Stable states of the related differential equation is a large subgroup of Poincare symmetry and enable us to precisely choose variety of models more compatible with laboratory data.

Keywords—tumor growth, mathematical model, ellipsoidal model, stability, vascular

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