Abstract

In this paper, a therapeutic strategy for the treatment of cancer using immunotherapy that aims to maximize the active immune response and to minimize the tumor cells level while reducing drugs side effects and treatment cost is proposed. Assume that the treatment amount that can be administered to a potential patient during therapy period is known precisely, an ODE model with control acting as an immunotherapy agent is presented and an optimal control problem is formulated to include an isoperimetric constraint on the immunotherapy treatment. The Pontryagin’s maximum principle is used to characterize the optimal control taking into account the fixed isoperimetric constraint. The optimality system is derived and solved numerically using an adapted iterative method with a Runge-Kutta fourth order scheme and secant method routine.

References

- R. Swanson, Carly Bridge, J. D. Murray, Ellsworth C. Alvord Jr: Virtual and real brain
Optimal Control with an Isoperimetric Constraint Applied to Cancer Immunotherapy

- Michael McAsey, Libin Mou, Weimin Han: Convergence of the Forward-Backward Sweep Method in Optimal Control.

Index Terms
Keywords
Interleukin-2  Isoperimetric constraint  Pontryagin’s maximum principle
Runge-Kutta fourth order scheme
Secant method routine