

ON THE DETERMINATION OF DRUG INPUTS TO THE SYSTEM THROUGH FUZZY MATHEMATICAL MODELLING

S. JAYAKUMAR AND B. ARUNRAJ

Department of Mathematics,
A. V. V. M. Sri Pushpam College (Autonomous),
Poondi 613 503, Thanjavur (DT), Tamil Nadu, India

Abstract

In this paper, we propose a model for the determination of drug inputs to the system, using a performance criterion. The performance criterion includes both state and control variables. We analysed the model by setting the minimization technique and obtains a system of linear algebraic equation for the discrete controls of drug inputs. For solving such discrete problems, we used the dynamic programming. The aim of the paper is to obtain a favourable outcome of the performance criterion subject to the perturbed equation together with the applicable constraints. We modelled the concentration of drugs by ordinary differential equations, in which the assimilation modelled by using a fuzzy parameter. The solution of the differential equations approximated with initial conditions and state variables. The assimilation is determined with the use of fuzzy rule based system (FRBS) which depends on the concentration of drugs and on its total induction levels. We processed all the rule bases using Mamdani's inference method with centre of gravity defuzzification. Designing and using the trapezoidal membership function gives us optimised result on assimilation. The calculated solution is compatible with the behaviour of drug inputs in relation to induction levels, as reported in the literature.

Keywords: Performance criterion, minimization technique, assimilation, fuzzy rule based system