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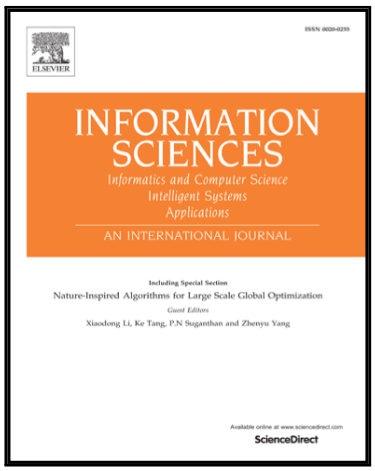

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Peilian Wang , Ran Liu , Zhibin Jiang

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Optimization of Combination Chemotherapy with Dose Adjustment Using a Memetic Algorithm

Peilian Wang, Ran Liu, Zhibin Jiang*

School of Mechanical Engineering, Shanghai Jiao Tong University, 800 Dongchuan Road, 200240, Shanghai, China

Abstract: The problem with optimizing cancer chemotherapy has often been formulated as optimal control models, which can be intractable. Such difficulty is compounded by the facts that chemotherapeutic drugs with different mechanisms of action are often used together and that dose adjustments are often warranted according to therapeutic responses in clinical practice. Against this background, this paper addresses the problem of combination chemotherapy with dose adjustment. We first construct a mathematical model of the problem by introducing two cell-cycle phase-specific chemotherapeutic drugs into a mono-chemotherapy model. Next, we design a memetic algorithm (MA) allowing dose adjustments to solve the problem. Finally, we compare the proposed MA with existing algorithms, investigate the efficacies of different treatment strategies, and identify the characteristics of the problem related to the quality of the solutions.

Keywords: combination chemotherapy; dose adjustment; drug specificity; memetic algorithm

Corresponding author: Professor Zhibin Jiang

E-mail addresses: peilianwang@sjtu.edu.cn; liuran2009@sjtu.edu.cn; zbjiang@sjtu.edu.cn

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