

Development of Mathematical Model for Radiotherapy Patient Scheduling

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Abstract

This research aims to develop a mathematical model for scheduling radiotherapy patients and reduce the time for finding solutions. Firstly, the procedure of the cancer treatment and the previous mathematical models were studied. Then, the previous mathematical model was improved to reduce the time for finding the solution. All constraints were checked and some redundant constraints were eliminated. After the mathematical model was improved, five small cases were generated to validate and verify the improved mathematical model. Based on the solution of the experiment, the results found that the improved mathematical model can reduce the time for finding a solution significantly. To enhance the mathematical model for use in a real-world case, this research developed the mathematical model based on adding the constraints such as surgical constraints and radiotherapy processing time constraints. Finally, the completed mathematical model was applied to the real case. According to the results, the proposed mathematical model can properly determine the duration of simulation and radiotherapy within the proposed constraints, assign each patient to the selected room and technology, and identify the list of the number of fractions for radiotherapy in each period. The proposed model will play a significant role in assisting decision-makers in efficiently considering radiotherapy patient scheduling in terms of reducing treatment planning time and staff error during radiotherapy patient scheduling.

Keywords—Mixed-integer programming model, Radiotherapy Patient Scheduling