

A Mixed Integer Programming Model for Optimizing the Layout of an Emergency Department

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Abstract : During the recent years, demand for healthcare services has dramatically increased. As the demand for healthcare services increases, so does the necessity of constructing new healthcare buildings and redesigning and renovating existing ones. Increasing demands necessitate the use of optimization techniques to improve the overall service efficiency in healthcare settings. However, high complexity of care processes remains the major challenge to accomplish this goal. This study proposes a method based on process mining results to address the high complexity of care processes and to find the optimal layout of the various medical centers in an emergency department. ProM framework is used to discover clinical pathway patterns and relationship between activities. Sequence clustering plug-in is used to remove infrequent events and to derive the process model in the form of Markov chain. The process mining results served as an input for the next phase which consists of the development of the optimization model. Comparison of the current ED design with the one obtained from the proposed method indicated that a carefully designed layout can significantly decrease the distances that patients must travel.

Keywords : Mixed Integer programming, Facility layout problem, Process Mining, Healthcare Operation Management

Conference Title : ICORSR 2017 : International Conference on Operations Research and Scheduling Research

Conference Location : Madrid, Spain

Conference Dates : March 26-27, 2017