Optimization of Train Scheduling by Integration of DEA, AHP and Simulation

This study presents an integrated simulation, multivariate analysis and multiple decision analysis for train scheduling. Furthermore, the integrated model is based on Data Envelopment Analysis (DEA) and Analytical Hierarchy Process (AHP) that is hybrid with computer simulation model. The integrated DEA AHP simulation model can be used for selecting optimum alternatives by considering multiple inputs and outputs. First, computer simulation is used to model verify and validate the system being studied. Second, AHP methodology determines the weight of any qualitative criteria (input or outputs). Finally, a DEA model is used for solving the multi objective model to identify the best alternative(s). An 808 kilometer train route system was selected as the case of this study. Visual SLAM language was used to develop the simulation model of the railway system. The simulation model was verified and validated against actual system by animation and t-test. Three unique features of the railway system which are time limitations, queue priority and limited station lines are included in the simulation model. The objective of simulation model is to increase reliability related to the time table of the passenger trains, to decrease average traverse time of passenger trains and to decrease average traverse time of cargo trains. In addition, for multivariate assessment of the alternatives by DEA, safety and cost factors are derived and considered from an AHP analysis.

Keywords: DEA, AHP, simulation, Integration

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