Optimizing the Passenger Throughput at an Airport Security Checkpoint

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Abstract : High-security standard and high efficiency of screening seem to be contradictory to each other in the airport security check process. Improving the efficiency as far as possible while maintaining the same security standard is significantly meaningful. This paper utilizes the knowledge of Operation Research and Stochastic Process to establish mathematical models to explore this problem. We analyze the current process of airport security check and use the M/G/1 and M/G/k models in queuing theory to describe the process. Then we find the least efficient part is the pre-check lane, the bottleneck of the queuing system. To improve passenger throughput and reduce the variance of passengers' waiting time, we adjust our models and use Monte Carlo method, then put forward three modifications: adjust the ratio of Pre-Check lane to regular lane flexibly, determine the optimal number of security check screening lines based on cost analysis and adjust the distribution of arrival and service time based on Monte Carlo simulation results. We also analyze the impact of cultural differences as the sensitivity analysis. Finally, we give the recommendations for the current process of airport security check process.

Keywords : queue theory, security check, stochatic process, Monte Carlo simulation