

WANG Sicheng, *Optimization and Simulation of the Flow of Passengers Based on Time Series Analysis*

Abstract

To maximize security while minimizing inconvenience to passengers in airport seems conflicting. Our goal is to analyze the flow of passengers at the security checkpoint, and optimize the passenger throughput without reducing security. We analyze the time series to determine the proper probability distributions, by which we can generate more data. We select candidate distributions by empirical Cumulative Distribution Function (CDF) plots and Cullen & Frey graph, then we fit the data to candidate distributions and visually evaluate the goodness of fit. We eventually choose the best distribution after applying Kolmogorov-Smirnov test. Due to two types of passengers (Pre-Check and regular), we particularly assume a mixture distribution of two normal distributions, and estimate the parameters. We model passengers passing through checkpoints as abstract servers. We develop a core algorithm describing behavior of such servers. The algorithm takes three inputs: arrival time, service time, and the number of servers. And it generates the start and end time of service. We define the waiting time, which equals to the end time minus the arrival time, as main object of our interest. We simulate the flow of passengers based on our model and the generated data. By comparing results of different parameters, we develop some modifications to the current process to improve passenger throughput and reduce variance. Finally we perform a more detailed sensitivity analysis and discuss how we should accommodate changes. We simulate different traveler styles by generating data with different means and standard deviations. Then we provide some improved modifications to increase the efficiency of civil aviation security system.

Keywords: *cumulative distribution function, simulation, flow of passengers.*

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