Final Project Proposal - Group 1, course CSDA1000SUMA18

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## Abstract

What are the effect of the different airlines performance on airport gate utilization.

## Introduction

The focus of the research is to determine the effect of airlines' performance on airport gate utilization on airports financials. The study will look at John F. Kennedy International Airport (JFK). JFK Airport is one of the busiest airports in the United States with close to 60 million passengers (2016 data). More than 90 airlines operate at JFK Airport using the more than 128 gates across six terminals.

## Competitive Analysis

In one research (Azmi, Razali, Ibrahim, Aziz, & Aziz, 2016), in order to solve discrete optimization problem, the SKF algorithm is combined with angle modulated approach. Airport gate allocation problem refers to the search for optimal assignment of flights to gates at an airport. Assignment of flight to gates has become very complex nowadays, especially for a big size airport. In this study, the airport gate allocation problem is solved using a recently introduced angle modulated simulated Kalman filter (AMSKF). The objective of this study is to minimize the total walking distance. A small case study with 14 flights and 16 gates has been chosen. Preliminary results show that SKF is a promising algorithm for solving the airport gate allocation problem.

Another paper (Barnhart, Fearing, Odoni, & Vaze, 2012) summarizes research trends and opportunities in the area of managing air transportation demand and capacity. Capacity constraints and resulting congestion and low schedule reliability currently impose large costs on airlines and their passengers. Significant capacity increases that would solve these problems are not expected in the near- or medium-term. This paper outlines first a number of directions for effecting improvement through marginal capacity increases and better management of demand and available capacity. It then describes strategic initiatives that

airlines and civil aviation authorities might undertake over time horizons of months to years as well as tactical measures that may be adopted on a daily basis in response to dynamic, real-time developments like poor weather or schedule disruptions. Research challenges in these areas are identified and classified in terms of specifying, allocating, and utilizing capacity. The first two categories reject challenges faced by infrastructure providers, the last category challenges faced by airlines.

Others(Bihr, 1990 think, that positioning of incoming flights should take into account the distribution of passengers among connecting flights. The larger the number of passengers arriving on flight X for destination A, the closer flight X should be positioned to the flight departing for A. This inquiry looks conceptually at this problem, reducing the distance passengers must walk from gate to gate. The criterion selected is minimization of the total passenger-distance travel for a given arrival-departure cycle. The problem can be conveniently cast as a 0,1 Linear Programming (LP) problem).

One report (Cook & Tanner, n.d.) is an update and extension of work published in 2004, also produced by the University of Westminster. This new report takes into account, as far as possible, relevant changes in the economic and regulatory environment since the earlier work. Whilst account has also been taken of the limited literature since 2004, the authors are not aware of any other new work comprehensively addressing European airline delay costs. Cost comparisons between the values reported earlier and the 2010 values are in unadjusted Euros, unless stated otherwise.

In another paper (Ding, Lim, Rodrigues, & Zhu, n.d.) the over-constrained Airport Gate Assignment Problem was studied, where the objectives are to minimize the number of ungated ???ights and the total walking distances or connection times. They approach the problem by ???rst using a greedy algorithm to minimize ungated ???ights and by developing exchange moves which then facilitate the use of heuristics. Simulated Annealing and a hybrid of Simulated Annealing and Tabu Search are used.

Airport gate assignment is of great importance in airport operations. In this paper (Li,

n.d.), the authors study the Airport Gate Assignment Problem (AGAP), propose a new model and implement the model with Optimization Programming language (OPL). With the objective to minimize the number of conflicts of any two adjacent aircrafts assigned to the same gate, the authors build a mathematical model with logical constraints and the binary constraints, which can provide an efficient evaluation criterion for the Airlines to estimate the current gate assignment. To illustrate the feasibility of the model the authors construct experiments with the data obtained from Continental Airlines, Houston Gorge Bush Intercontinental Air-port IAH, which indicate that our model is both energetic and effective. Moreover, the authors interpret experimental results, which further demonstrate that our proposed model can provide a powerful tool for airline companies to estimate the efficiency of their current work of gate assignment.

To help researched see how your airport is performing with FlightStats monthly On-time Performance Report, this report ("Airline on-time performance reports," n.d.) compares the on-time arrival performance of major and regional airports around the world .

in that report ("Data elements," n.d.) Load Factor (passenger-miles as a proportion of available seat-miles in percent ) for All Carriers and All Airports.

Optimizing gate assignments at airport terminals is analysed in this article ("Optimizing gate assignments at airport terminals," 1998).

Airline On-Time Statistics and Delay Causes is presented here ("OST_R BTS Title from h2," n.d.).

This thesis (Riedel, 2006) presents an approach for predicting operational performance of airlines on the basis of flight schedules and aircraft assignments. The methodology uses aggregate measures of properties of aircraft assignments, called Aircraft Assignment Key Performance Indicators (KPIs), and aims to find correlations between them and the operational performance of the airline. A simulation experiment is prepared to gather a large set of data points for analysis. A motivation is given for the use of control theoretic approaches in airline operations to utilize the KPIs as a basis for initial planning and

corrective actions.

## Proposed plan

Use Airline gate operations performance over a 1997 to 2008 using available data from bureau of transportation statistics- explain what performance means:

Focus status on New York John F. Kennedy Airport.

Scope of performance indicators on arriving domestic flights are limited to as follows: - Arrivals - Domestic flights - Number of flights - Number of passengers - Number of delays coming in / going out - Number of Cancellation

Apply financial estimates of the performance using available research on: - Lost revenues for cancelled flights at JFK - Estimate delay costs using European proxy studies adjusted for currency parity between Euro and USD - Publicly available blended load factor for airline group (i.e. United Airlines, American Airlines) as opposed to actual carrier

## Potential Risks

Use of assumptions including past performance to predict future performance. Simplifying cost estimates such as aggregate load factors and blended costs. Reliance of public data without management inputs. Excludes normalization of data for abnormal, one-time events.

## Cost/benefit analysis

## Conclusion

Airports perform complex operations that involve close coordination between the airlines, passengers and airport authority. Optimizing gate operations benefit all these stakeholders. Airlines can avoid the direct cost of delays. Passengers are able to have a better airport experience. Airports are able to maximize the use of gate facilities and avoid unnecessary capital builds.

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