Dataset Description

1. Introduction

This synthetic dataset includes information regarding the initial slot allocations and declared capacities for a network of Brazilian airports, based on the information obtained from the databases of Brazilian National Civil Aviation Agency (ANAC, 2021). The modifications made in the original dataset in order to create the synthetic dataset are described in the subsequent sections of this file. In addition, the dataset includes the IATA connectivity indices and betweenness centrality measures, calculated using the historical flights information, which was also obtained from databases of Brazilian National Civil Aviation Agency (ANAC, 2021) through the R package, flightsbr, developed by the Institute for Applied Economic Research (Ipea), Brazil (Pereira, R.H.M., 2022).

The way the synthetic data was produced reflects the authors' views. ANAC is not responsible for or endorses the conclusions or results obtained from the data used from their databases.

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2. Synthetic Initial Slot Allocation Data

This synthetic data includes information, which was generated using the files published on the databases of Brazilian National Civil Aviation Agency (ANAC, 2021).

For 2019 summer season, 13 airports were declared as coordinated. Since the initial slot allocation data for one of these airports was not published at the time of this study, we did not include this airport in the experiments. There were also 8 airports declared as facilitated. For the four of these facilitated airports, there was no initial slot allocation data published. Therefore, these were not considered, either. Finally, for the remaining four of these facilitated airports, there was no data belonging to S19 season, but the data for the S18 season was available. Therefore, for these four

airports, the data for the S18 season was used after adjusting them to have a compatible duration with S19 season. Eventually, 12 coordinated and 4 facilitated airports were included in the experiments.

We made some amendments to the original initial slot allocation data to make it usable for our problem. The following assumptions and adjustments were made in order to produce the synthetic data:

- Since the data does not specify the historic rights, we compared the allocations with the previous year's allocations and tried to match the requests by using their attributes such as flight IDs, operating days, and operating airports. However, as the previous allocations data was not available for four of the airports, 40% of the requests were randomly selected to be historic, which is in line with the proportion of the historic requests used in the literature.

- As the data does not have the information on the paired requests, i.e., the departure request at the origin airport and the corresponding arrival request at the destination airport, we matched the individual requests according to their allocated times, operating dates, and flight IDs.

- Since the data does not have the information on paired requests for the same aircraft at the same airport, we matched arriving and departing flights for the same aircraft at each airport. The requests having the same airlines, aircraft type and operation days throughout the season, and compatible allocated times were matched. To do this, the aircraft types in the dataset were analyzed. There were 41 types of aircraft in the data, 20 of them are classified as "heavy" and the remaining are classified as "medium" according to the aircraft type designators (ICAO, 2022). Therefore, while matching the requests, 30- and 60-minute differences were sought for those operated by a medium and a heavy aircraft, respectively. In the experiments, turnaround times for these paired requests were therefore assumed 30 or 60 minutes, if the corresponding aircraft is classified as medium or heavy, respectively.

- While using data from S18 season, as the days in this season are different from those in S19 season, we deleted the flights that are operated on different days to have a compatible duration with S19 season.

Following these assumptions and adjustments, a set of synthetic initial slot allocations was obtained, which can be found in the accompanying Excel file in the dataset. The details of this file are as follows:

- In the "Allocations Information" sheet, the initial allocations used in the optimization are listed. The columns A-H present an ID given to the allocation such that paired allocations can be tracked; anonymized origin and destination airport codes of the flight (note that, if the airport is not one of the 56 airports in Brazilian domestic network, its code is #N/A); movement type of the flight – dep and arr for departures and arrivals, respectively; anonymized airline code (extracted from the flight ID in the original data); allocated slot (calculated using the allocated time); allocated hour and minute as in the original data. The following columns have the information whether the corresponding flight operates at a certain day or not. It is represented with a "1" and "0", respectively.
- In the "Allocations with Historic Right" sheet, the allocations belonging to the requests, which were assumed to have historic rights are listed. The columns have the same information with the "Allocations Information" sheet.
- In the "Paired Allocations" sheet, the paired departure and arrival allocations are listed. Column D presents the flight times used in the experiments for these pairs, in 5-minute slots (flight times are obtained from https://www.flighttimecalculator.org).
- In the "Same Aircraft PairedAllocations" sheet, paired arrival and departure allocations for the same aircraft at the same airport are listed. Column D presents the turnaround times used in the experiments for these pairs, in 5-minute slots.

3. Declared Capacity Values

The capacity values are taken from the original capacity declaration documents, which were obtained from the databases of Brazilian National Civil Aviation Agency (ANAC, 2021). Due to lack of data for S19 season at the time of this study, for one the airports, the capacity parameters belong to S22 season, and for other three airports, the parameters belong to S18 season.

In the Capacities sheet, the runway capacity values are listed for arrivals, departures, and total movements for each hour of the day. In Column A, the index of the hourly time interval is

provided, whereas the beginning times of the intervals are given in Column B. For example, the first time interval is between 00:00-01:00. The parameters of all airports are given next to each other in Columns C-AX.

Note that, if, after the amendments made as explained above, the number of movements in the synthetic dataset exceeded the original capacity values, the capacities were revised to ensure feasibility.

4. Calculated IATA Connectivity Indices and Betweenness Centrality Measures

IATA connectivity indices and betweenness centrality measures used in the computational experiments for 56 airports in the network are provided in the last two sheets of the file, respectively.

The data used for the calculation of the IATA connectivity indices and betweenness centrality measures contains data on the flights operated during the summer scheduling season of 2019, i.e., between 31 March 2019 and 26 October 2019. This information was obtained from the database of Brazilian National Civil Aviation Agency (ANAC, 2021) through the R package, flightsbr, which was developed by the Institute for Applied Economic Research (Ipea), Brazil (Pereira, R.H.M., 2022).

References

ANAC, 2021. Slot coordination. https://www.anac.gov.br/en/air-services/slot-coordination. Last accessed 4 January 2022.

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