

Arrival Management with Open Data

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Abstract—This document is a sample illustrating the Quarto `ieeetran` template. It includes the key elements of a scientific articles (references, equations, figures, tables, code, cross references). The template enables the generation of IEEE-formatted article from a Jupyter notebook.

I. INTRODUCTION

The contribution of this paper comprise:

- conceptualisation of sequencing separation for arrival management and development of an open data and open software based implementation of the approach; and
- use-case application of the developed approach on a subset of airports within the European

II. TRAJECTORY-BASED OPERATIONS - ARRIVAL MANAGEMENT

A. header 2

some cool text.

Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release of Letraset sheets containing Lorem Ipsum passages, and more recently with desktop publishing software like Aldus PageMaker including versions of Lorem Ipsum.

III. DATA AND CONCEPTUAL APPROACH

A. Approach

data preparation

- trajectory data - Opensky Network, weekly downloads
- airport information - Openstreet Map

data downloaded & script development, data cleaning

1) *Trajectory Flight Phase Segmentation & Milestone:*

Different approaches exists to detect and describe aircraft flight phases, e.g. recent machine learning algorithm [1]. This paper implements a heuristic approach with a focus on the detection of arrival traffic at the study airports.

2) *Landing Runway Identification:* The identification of the landing direction is based on a simple geospatial heuristic. Conceptually, aircraft are aligned with the runway (centerline) before landing. An aircraft is assigned to a landing runway based on the closeness of its pre-landing positions to the extended runway centerline.

B. Open Data for Operational Performance Monitoring

C. Arrival Sequencing

sequence separation

IV. CASE STUDY - RESULTS

A. Data Sampling

At the time of writing no global open flight table exists. For this study, we validated the sample with reference data available to the Performance Review Unit. Under the EUROCONTROL Performance Review System, airport operators report movement data on a monthly basis [2].

V. CONCLUSIONS

This paper aimed at exploring a data-driven approach to measuring arrival management based on open data.

REPRODUCIBILITY

This paper has been built with the R/RStudio ecosystem. The draft manuscript and its supporting data preparatory steps are archived at <https://github.com/rainer-rq-koelle/paper-2023-ICNS>.

The script to download the weekly global datasets are included. The cleaned trajectory data is stored at: «tbd».

ACKNOWLEDGMENT AND DISCLAIMER

The authors thank the comments by XX YY ZZ.

The views expressed are the authors' own and do not represent a policy or position of EUROCONTROL .

REFERENCES

- [1] J. Sun, J. Ellerbroek, and J. Hoekstra, "Flight extraction and phase identification for large automatic dependent surveillance–broadcast datasets," *Journal of Aerospace Information Systems*, vol. 14, no. 10, pp. 566–572, 2017.
- [2] EUROCONTROL, "Eurocontrol Specification for Operational ANS Performance Monitoring - Airport Operator Data Flow." 2019 [Online]. Available: <https://www.eurocontrol.int/publication/eurocontrol-specification-operational-ans-performance-monitoring>

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Extra footnote..