

Data Process - Modelling - Conventions / Methods

This paper summarises the data preparatory action and methods developed for the paper.

Trajectory

We tap into OSN data. A trajectory is a series of time-ordered 4D positions, i.e., TIME, LAT, LON, ALT, associated with a FLTID, and some complementary data (e.g. first derivatives, special codes)

Single Flight: Represent each trajectory as a 4D function

$$flight_i \rightarrow T_i(t)$$

$$T_i(t) = (x_i(t), y_i(t), z_i(t), t), t \in [t_{start_i}, t_{end_i}]$$

A **trajectory set** comprises multiple flights, a collection of multiple trajectories

$$\{T_1(t), T_2(t), \dots, T_N(t)\}$$

Arrival Flights - Characteristic Milestones

An arrival flight is defined by the path flow from *entry of arrival airspace* to *touchdown* at the landing runway.

Dependent on the data coverage, open ADSB data might not be available until touchdown. For this purpose, we can define a (*landing*) *gate* position located about 6NM before landing runway.

Conceptually, we consider a milestone the 4D position of a flight event. Thus, milestones are implicitly representing timestamped flight events (e.g. actual time of landing [ALDT]).

- **entry of arrival airspace**: conceptually the first entry into the arrival airspace; for this study we define the entry at 200NM from the landing aerodrome, i.e., its aerodrome reference point (ARP)
- **top of descent (TOD)**: a point in space from which the descent to the airport for landing is started
- **landing gate**: a point at 6NM before the landing runway threshold; arrival procedures typically foresee a final approach fix etc.; we generalise this to be at 6NM - the actual values at different airports may vary for different arrival procedures. At this point in time the arriving flight is considered in sequence for the landing.
- **touchdown / actual time of landing (ALDT)**: the landing performed by the flight; dependent on data coverage this event may be detected (or needs to be estimated based on previous positions / landing profile). It must be noted that aircraft cross the end of the runway / threshold at a specific safety altitude. For example, the ground point of intercept of an ILS approach is typically located 800-1000ft after the landing threshold.

Note: we may approximate the ALDT as the time of (spatially) crossing the threshold.