Predicting Arrival Time Uncertainty from Actual Flight Information

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AMAN: Extending the Horizon

Diagram:
- **ATC**
  - Flow Management
  - AMAN
  - Tactical ATC

- **Airline**
  - boarding & departure
  - en-route
  - arrival

Timeline:
- 24 hours
- 3 hours
- 1 hour
- 20 minutes
- 0 min
AMAN: Extending the Horizon
AMAN: Extending the Horizon

19 busiest connections from Amsterdam (2013)
AMAN: Uncertainty
AMAN: Uncertainty

ETTA Uncertainty # of replans
AMAN: Using Uncertainty
AMAN: Using Uncertainty

De Wit, et. al. (2014). “Supporting runway planning by visualizing capacity balances of arriving aircraft streams”
Predicting Uncertainty

\[ \sigma_t = \int_0^t f(\sigma_1, \sigma_2, \ldots, \sigma_n) \, dt \]
Predicting Uncertainty

All flights with condition \((x, y, z)\)
Predicting Uncertainty

All sets of conditions
Flight Update Message
- Format according to standards
- Has ARCID, ADEP, ADES, DOF
- Inbound EHAM
- FPL in first message
- Not CNL, DIV, AFL, (CHG, ACH)

- Last received estimate
- WRT ATA
- To fixed ETA values
- Use EDEXP FLTSTATE
  If not available use DEP

- ETA
- FLTSTATE
- (HoD)
- (DoY)
Flight Update Message
Message Analysis

341757 Flights, 1724658 messages
Message Analysis

- Two histograms showing the distribution of messages over time:
  1. Left histogram: Time to actual arrival (min) with four categories: FI, SI, TA, AA.
  2. Right histogram: Time to predicted arrival (min) with the same categories.

TU Delft
Error Analysis
Error Analysis
Error Analyses
Error Distributions
Error Distributions

Prediction Horizon

Flight State (FI, SI, TA, AA)
Error Distributions

Flight State (FI, SI, TA, AA)

Prediction Horizon
Error Distributions

Scheduled Arrival Time in Original Flight Plan

Flight State (FI, SI, TA, AA)
Error Distributions
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Effects of CDM