Advanced Statistical Signal Processing for Next Generation Trajectory Prediction

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(Virtual)

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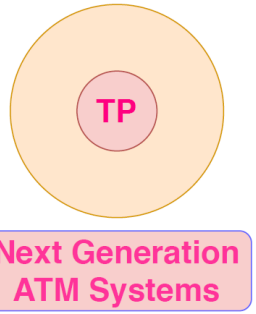
Introduction

Accurate and reliable TP:

- Next generation of **onboard** and **ground-board** DSTs:
- Enhanced safety net:

The aim of this PhD:

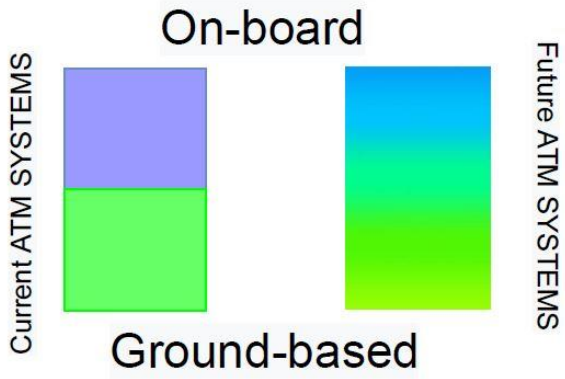


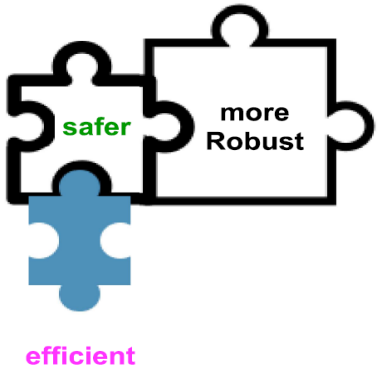
New SSP approach to improve TP in new generation ATM systems

TP for the flight **execution phase**.

Onboard TP

Ground-based TP





** Trajectory Prediction (TP), * Decision Support Tools (DST), * Statistical Signal Processing (SSP), * Air Traffic Management (ATM), * Trajectory Based Operations (TBO), * Single European Sky ATM Research (SESAR), * Next Generation Air Transportation System (NexGen),*

PhD Research Objectives

Towards **Robust TP** Solutions.

- **O1**: **Probabilistic characterization** of the **TP** problem at hand, and formal analysis on the limitations of standard filtering techniques for TP (i.e., impact of a **misspecified** system).

- **O2**: **Robustification** of the current filtering techniques and development of **new robust approaches for TP** (i.e., relying on **linearly constrained** filtering, using **covariance estimation** techniques or advanced **Bayesian filtering** solutions).

From Single to **Multiple Aircraft TP**.

- **O3**: Extension of the **robust filtering** approaches developed in O1 to **multiple aircraft TP**.

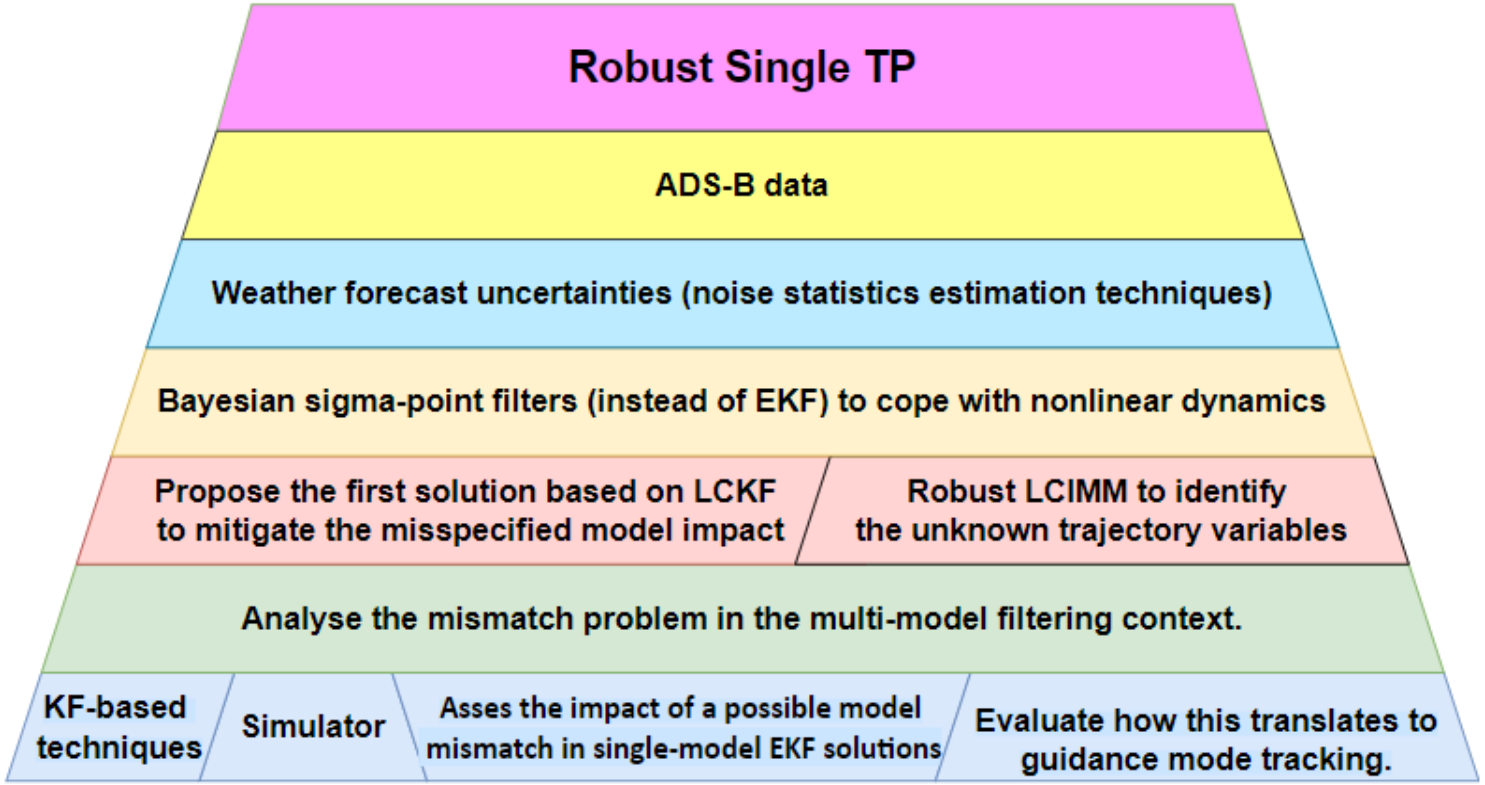
From **Centralized** to **Cooperative** Processing.

- **O4**: Development of **distributed or cooperative robust filtering** techniques, as an extension of the methodologies developed in O1 to enable **self-separation**.

**** Trajectory Prediction (TP), * Objective (O),***

Methodology

Towards **Robust TP** Solutions (**O1** and **O2**):

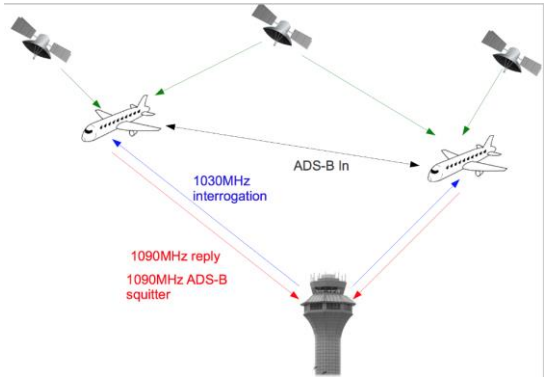


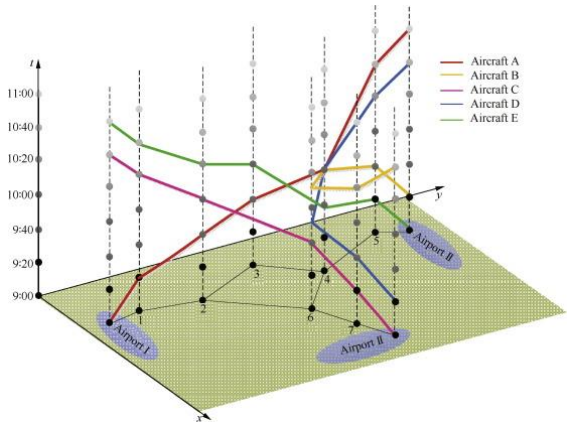
** Trajectory Prediction (TP), * Extended Kalman Filter(EKF), * Automatic Dependent Surveillance Broadcast (ADS-B), * Linear Constraints Kalman Filter (LCKF), * Linear Constraints Interacting Multiple-model (LCIMM),*

Applications

Case studies to appraise the impact of the **proposed methods** in applications which demand **TP**:

- Improving the **MTCD-like** systems or more general **CDR** algorithms.
- Improving **self-separation** algorithms.
- **Multi aircraft** CD.





** Trajectory Prediction (TP), * Medium Term Conflict Detection (MTCD),*
** Conflict Detection and Resolution (CDR), * conflict detection (CD)*

Thank you for your attention

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