Technische Hochschule Ingolstadt

Faculty of Computer Science

The Future of AI in Air Traffic Management: Coordinating Autonomous Airliners and UAM within Busy Airspaces using AI

Seminar Paper

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Affidavit

I certify that I have completed the work without outside help and without using sources other than those specified and that the work has not yet been submitted in the same or a similar form to any other examination authority and has been accepted by them as part of an examination. All statements that have been adopted literally or analogously are marked as such.

Ingolstadt, 11 May 2025

Signature

Abstract

The summary gives the reader a rough overview of the content (brief problem definition, approach, solution approaches and possibly key findings). The scope should be about half a page. This chapter is not mandatory and should only be considered optional.

Contents

1 Introduction

1.1 Urban Air Mobility (UAM)

According to European Union Aviation Safety Agency (EASA), urban air mobility (UAM) refers to an air transportation system for passengers and cargo in urban environments.It primarily consists of electric VTOL (eVTOL) aircrafts, with air taxis used for passengers and drones for delivery of cargos, surveillance, and photography. These aircrafts can either be remotely piloted or with a pilot on board [1]. If these aircrafts are capable of autonomous flying, it is considered a part of unmanned aerial vehicle (UAV).

1.2 Autonomous Airliners (AA)

Autonomous airliners represent a branch of UAVs, consisting of fixed-wing aircraft capable of flying and navigating without direct intervention of a human pilot, for passenger service. Although modern commercial airliners already automate approximately 93% of flight functions, there remains a growing demand to implement higher levels of autonomy [2]. Increased automation is seen as a path toward enhanced safety, greater scalability, and improved affordability.

1.3 Differences between UAM, AA and UAV

UAM differs from traditional aircrafts with its use of rotors, and the ability to take off and land vertically from almost anywhere with a suitable platform, such as vertiports, and helipads, whereas traditional aircrafts are mostly equipped with fixed wings and require runways to operate [3]. Its range of opperation also differs, with UAM operate in urban areas (intra- and inter-city) while traditional aircrafts are able to operate for long distance travel, but only to locations with runway availability. Fig. 1 shows the comparison between UAM, UAV and conventional aircrafts. Fig. 2 shows the distance which the aircrafts travel to and from, as well as the airspace it occupies.

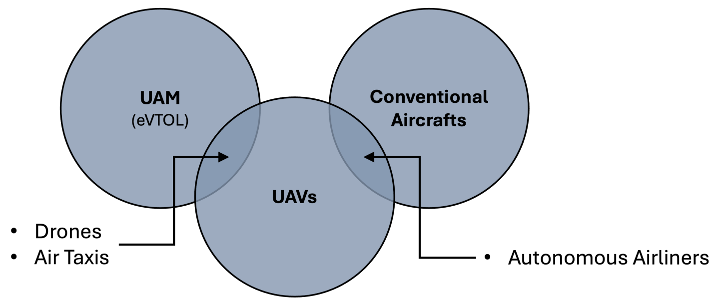

Figure 1: Venn diagram of UAM, UAV and conventional aircrafts.

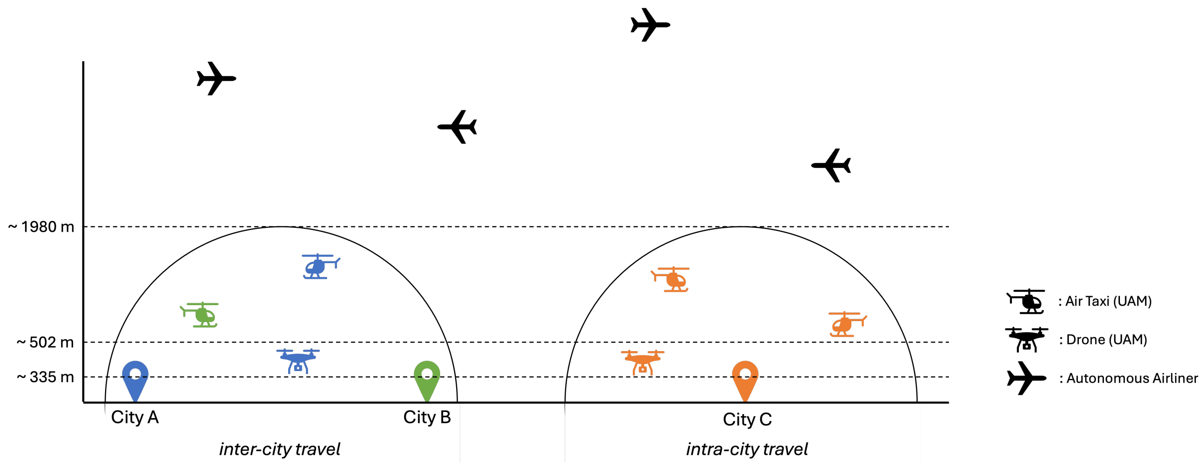

Figure 2: Mobility of UAM and autonomous airliners.

1.4 Objective

2 Future of AI in ATM

3 Challenges of AI in ATM

4 Conclusion and Outlook

Acronyms

EASA European Union Aviation Safety Agency. 1

eVTOL electric VTOL. 1

UAM urban air mobility. 1, 2

UAV unmanned aerial vehicle. 1

References

[1] European Union Aviation Safety Agency. *What is UAM.* Accessed: 2025-05-05. URL: https://www.easa.europa.eu/en/what-is-uam.

[2] Samuel Vance, Evan Bird, and Daniel Tiffin. "Autonomous Airliners Anytime Soon?" In: *International Journal of Aviation, Aeronautics, and Aerospace* (Jan. 2019). DOI: 10.15394/ijaaa.2019.1402.

[3] Bianca I. Schuchardt et al. "Air Traffic Management as a Vital Part of Urban Air Mobility—A Review of DLR's Research Work from 1995 to 2022". In: *Aerospace* 10.1 (2023). ISSN: 2226-4310. DOI: 10.3390/aerospace10010081. URL: https://www.mdpi.com/2226-4310/10/1/81.