

Data fusion concept for a sense and avoid system on-board small UAV

Michał Skowron-Nadulski¹⁾ Janusz Narkiewicz²⁾

¹⁾ Łukasiewicz Research Network – Institute of Aviation

²⁾ Warsaw University of Technology

Abstract:

In the recent years, significant advances in automation and machine learning (ML) have been made, allowing novel applications, also in aviation. ML algorithms enabled enhancements in many aviation applications, such as improving maintenance or optimizing operation, planning flight routes [1]. Important part of aviation industry benefiting from the progress of ML are Unmanned Aerial Systems (UAS).

The objective of the research presented in this paper is to implement machine learning based sensor fusion algorithm, intended to be a part of a real-time Sense and Avoid (SAA) systems installed on board of a small UAV. During the first phase of the research, high-level overview of the SAA and data fusion systems, including frameworks and data flow were investigated.

Various SAA aspects were studied such as current challenges, desired functionality as well as data fusion methodologies. Moreover, different data fusion concepts were reviewed such as relations with other systems in formal frameworks [2], topology of data acquisition and processing [3], functional relation between sensor data, and input and output of data and information.

As required for prospective system implementation, radar and stereovision were selected as sensors for data fusion. These sensors are competitive data sources i.e., they may provide information on the same environmental feature: images and distance to the observed objects.

The UAS are prone to many external threats, like civil or military aerospace traffic, general aviation or birds. To mitigate the risk, Sense and Avoid systems are developed, enabling platforms to sense, detect and execute threat avoidance strategy using on-board and off-board resources (sensors, computational platforms). Proposed algorithm is intended for detecting and identifying potentials threats to the flying platform.

Preliminary results of the research will be presented during the conference.

Bibliography

- [1] R. Marcos, O. García-Cantú and R. Herranz, "A Machine Learning Approach to Air Traffic Route Choice Modelling," *arXiv preprint arXiv:1802.06588*, 2018.
- [2] W. Elmenreich, "A review on system architectures for sensor fusion applications," in *IFIP International Workshop on Software Technologies for Embedded and Ubiquitous Systems*, 2007.

[3] F. Castenado, "A Review of Data Fusion Techniques," *The Scientific World Journal*, vol. 2013, 2013.