

Manoeuvre Classification for Utility-Class Sailplanes Based on Data from Inertial Navigation Systems

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Abstract. A Manoeuvre Classification System based on Inertial Navigation Systems may be a valuable tool for various use cases. Automating the task of tracking a pilot's manoeuvres may significantly reduce the human effort required to trigger in-flight actions or to label flight data for future machine learning model training. The work explores the process of designing an algorithm for the detection and classification of typical manoeuvres in sailplane flight. The manoeuvres are divided into two categories: low-level, such as turns, and steady flights, and high-level, such as take-offs, landings, or thermal lift circling. A two-layered algorithm is proposed, as the high-level manoeuvres are found to be mainly composed of low-level ones, differentiated only by vertical speed. The identification of significant flight parameters revealed that only the angular data were necessary for low-level manoeuvre detection. The lack of positional data in the classification process makes linear accelerations and GNSS positioning optional additions to improve attitude estimation. It allows for a robust implementation, even in high radio-noise or electrically screened environments. With the high-level manoeuvre classification combining the low-level results solely with vertical speeds and altitudes, the proposed algorithm can be implemented on a discrete device installed on a sailplane in a completely non-invasive manner.