

Measuring from the sky: UAV-based instruments

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Unmanned Aerial Vehicles (UAVs), commonly known as drones, have witnessed a surge in popularity due to their versatility and adaptability across various industries. Their lightweight construction, compact size, affordability, and ease of operation make them ideal platforms for a wide range of measurement applications. These attributes particularly shine when the target measurements are dispersed over vast areas or located in challenging environments inaccessible to humans.

A UAV equipped with sensors transforms into a sophisticated measurement platform, necessitating comprehensive characterization to ensure measurement traceability and accuracy. This tutorial aims to delve into the intricate architecture of UAVs, illuminating their subsystems and elucidating the myriad parameters that can influence onboard sensors and measurements. Understanding these subsystems and parameters is crucial for optimizing UAV-based measurement systems for diverse applications.

The tutorial will discuss the architecture of a UAV, delineating its integral subsystems such as propulsion, navigation, communication, and payload integration. Each subsystem plays a pivotal role in the overall functionality and performance of the UAV, directly impacting the quality and reliability of measurements.

Moving forward, the tutorial will pivot towards exploring the vast array of sensors and measurement systems that can be seamlessly embedded into UAV platforms. These sensors encompass a spectrum of technologies including optical, thermal, LiDAR, multispectral, and hyperspectral sensors, each offering unique capabilities suited for specific applications. By delving into the operating principles and applications of these sensors, attendees will gain invaluable insights into harnessing the full potential of UAVs for diverse measurement tasks.

Furthermore, the tutorial will delve into real-world measurement applications where UAVs have demonstrated unparalleled efficacy. From precision agriculture and environmental monitoring to infrastructure inspection and disaster management, UAVs have revolutionized data acquisition methodologies across numerous domains. However, achieving accurate and reliable measurements via UAVs necessitates a meticulous analysis of the entire measurement chain, encompassing factors such as flight parameters, environmental conditions, sensor characteristics, and data processing techniques.