Thermographic Inspection using Drones: Principles and Case studies

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Non-Destructive Inspection (NDI) using drones is rising as a field of interest for many industries like the inspection of wind turbines and composite components in airplanes. In addition to the flexibility of maneuver and time- and cost-effectiveness presented by drones, they can increase data consistency and operational safety significantly while decreasing the number of required staff. In the aerospace industry, using composite materials has been increased considerably to overcome the barriers of using metals. Composites are lightweight and high-temperature resistant, making them ideal for manufacturing high-performance and economic airplanes. Inspecting and maintaining these composite structures are essential to ensure the airplane's safety and structural integrity. Active thermography is a reliable, accurate, and effective type of Non-Destructive Inspection (NDI) for inspecting composite components of the fuselage, wings, and primary and secondary structures in airplanes and for inspecting the blades and internal and external structures in wind turbines. Despite the recent developments in aerial thermographic inspection to feasibly detect defects, many limitations and challenges still need to be addressed. In this study, the challenges in the aerial thermographic inspection are explained. Also, the drone-based active thermographic inspection of airplane components is comprehensively explored. Moreover, we discuss our case studies regarding aerial thermographic inspection in different fields like wind turbines and aerospace components.