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Thermographic Inspection System for Surface Coating Defects on Aircraft Fuselage

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Aircraft outer shell is coated with a corrosion resistant layer because its alloy does not possess sufficient intrinsic resistance to wear and corrosion. Impacts by small particles or large objects such as bird strikes can lead to damage the coated surface inducing surface defects. Micro cracks initiated due to surface damages create stress concentration zones which could lead to catastrophic failure of the aircraft due to fatigue crack formation. Therefore, the importance of regular inspection of surface coating is highlighted. Visual inspection is widely used for surface damage identification, but manual procedures with the bare eye are time-consuming and lead to human errors. Effective automation of the inspection can be considered a viable solution. The aim of this project was to develop an automated inspection system based on non-contact, non-destructive Infrared Thermography to identify defects on an aircraft's surface coating. The system developed was a two-axis gantry attached to a four-wheel structure equipped with a tiltable thermal camera assembly and a control panel. The inspection method follows a sequence – Firstly, thermal image capturing, secondly image processing and identifying the defective area, and thirdly, giving a signal to the operator if a defect is present. The system was tested on a significant dataset, and its capability of detecting surface defects on an aircraft's coating was demonstrated. The results suggest an automated thermographic inspection system for surface coating defects on aircrafts can successfully replace visual inspection leading to a 9.25 % increase in efficiency minimizing its inherent disadvantages.

Keywords: *thermographic inspection, aircraft defect detection, image processing*