

Licensing Opportunity: Non-destructive testing and location of internal defects

Overview

This technology can be used to reveal and locate internal defects using flash infrared thermography (FIRT).

This non-destructive testing method and system can be used in real-time to reveal defects on three-dimensional structures and has applicability in quality control and process optimisation for additive manufacturing. It could also have potential to determine the 3D shape and outline of tumours and plaques in medical applications.

Technology

Flash thermography involves exciting a sample with a heat source and recording its surface temperature over the time with a thermographic camera. The propagation of this heat wave through the sample is influenced by the thermal properties of the sample's materials. This flash heating creates variance to the systems thermal equilibrium, which highlights defects due to their differing thermal properties.

By tilting the heat source, this technology allows for the imaging of sections of the penetrating heat diffusion. This differs from tomographic methods as the camera itself is maintained at a constant position. Due to the illumination of the defect originating from the flash heating, the heat sources angle allows for highlighting features of the defect otherwise impossible to visualize with symmetric heating of the defect.

The main competing technologies for 3D internal defect detection are x-ray and ultrasound. The primary advantage this technology exhibits over existing methods is remote measurement and a cheaper and more accessible set-up.

X-ray measurements require mm distance to the sample and also require dosage calculations and comprehensive health and safety protocols.

Ultrasound requires perfect contact, with a matching micro gel layer between the transducer and sample, whereas 3D-IRT works perfectly through air.

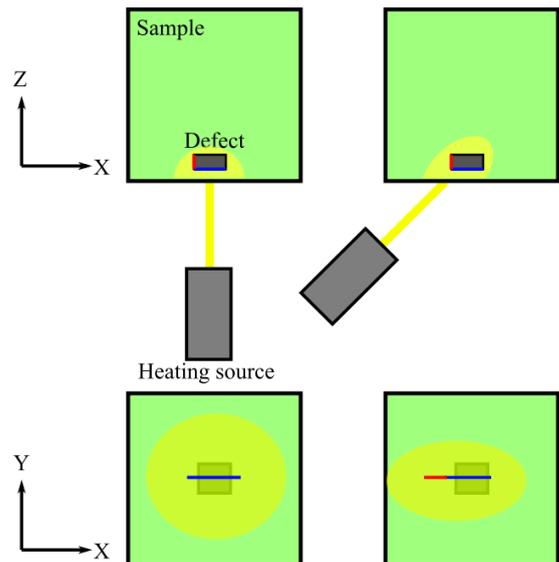


Diagram 1. Showing the operating principle of flash thermography (left), as heat lamps warm the surface and volume of the sample, the variation in thermal properties experienced by subsurface defects within the sample become evident on the surface temperature. By angling the heat source similar diffusion effects from flash thermography are seen, but the length (marked red) is also present in the surface temperature.

Commercial Opportunity

The University of Limerick is interested in seeking partners to exploit the commercial potential of these technologies by entering into licensing agreements.

Potential partners could include composite material manufacturers, manufacturers of 3D printed products, aerospace part manufacturing, concrete inspection, ceramic manufacturers.

This technology is subject to a PCT Patent application, Publication number: WO2021205041A1

See also O'Mahony *et al.*, 2020, Journal of Thermal Analysis and Calorimetry 142:473–481

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