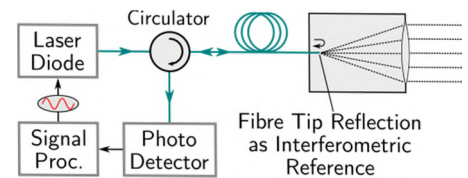


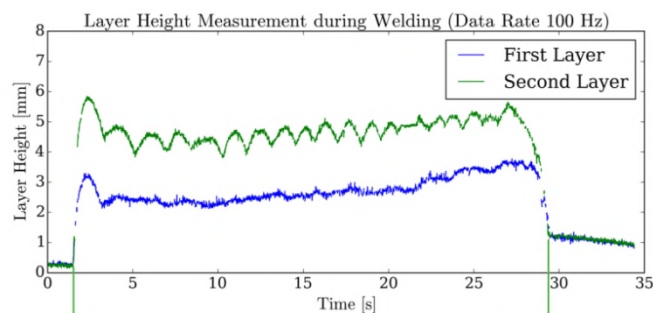
Range-resolved interferometry

- Range-resolved interferometry [1] is a novel interferometric signal processing concept pioneered by Engineering Photonics at Cranfield University, allowing signal sources to be multiplexed based on their range.
- Using simple, cost-effective and robust interrogation systems aimed at exploiting the potential of standard telecoms laser diodes that are inherently highly coherent, enabling high-quality interferometric measurements.



Simple optical setup

Position



Photograph of second layer

Application of absolute position measurements to welding layer height measurements

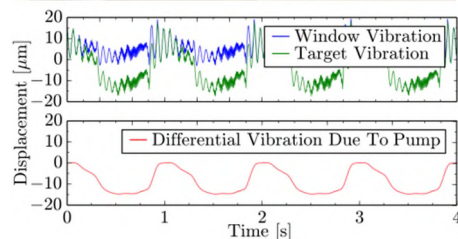
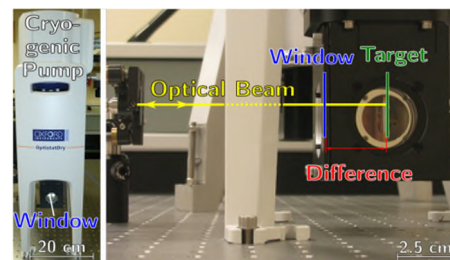
- Stray-light insensitivity to arc light allows measurements during welding operation.
- Ultra-compact measurement head consisting only of a fibre collimator/focuser with low numerical apertures.
- Typical resolutions between 10 and 50 μm at 100 Hz to kHz bandwidths over large dynamic ranges >10 cm.

Further information:

[1] T Kissinger, T O H Charrett and R P Tatam, "Range-resolved interferometric signal processing using sinusoidal optical frequency modulation", *Opt. Express*, **24**, pp. 9415-9431, 2015.

[2] T Kissinger, T O H Charrett, S W James, A Adams, A Twin and R P Tatam, "Simultaneous laser vibrometry on multiple surfaces with a single beam system using range-resolved interferometry", *Proc. SPIE* **9525**, pp. 952520-952520-7, 2015.

Vibrometry



Application of interferometric displacement measurements to multi-surface vibrometry [2]

- Allows simultaneous measurements of multiple signal sources along optical beam.
- Nanometre resolution at >100 kHz interferometric bandwidths.
- Multiple surface capability allows local referencing of measurements using an additional window to improve environmental noise rejection.

Centre for Engineering Photonics

About Cranfield University

Cranfield is an exclusively postgraduate university that is a global leader for transformational research in technology. Cranfield is focussed on the specialist themes of aerospace, defence and security, energy and power, environment and agrifood, manufacturing, transport systems, and water.

Cranfield has the largest number of engineering and technology postgraduates in the UK, awards over five percent of the UK's engineering and technology PhDs each year and currently works with over 1,500 companies and organisations worldwide.

Cranfield is ranked in the top five of UK universities for commercial research income, with 81% of Cranfield's research classed as world-leading or internationally excellent by REF (Research Excellence Framework, 2014). Cranfield University was formed in 1946 as the College of Aeronautics, the first postgraduate college of its kind.

The Centre for Engineering Photonics

Engineering Photonics at Cranfield is recognised internationally as a leading centre for optical sensing and instrumentation, which, since its inception in 1989, has been led by Professor Ralph Tatam. Engineering Photonics undertakes research ranging from blue skies concepts to the development of prototype instrumentation that is used by us and our academic and industrial collaborators in real environments. Further information about the Centre and a full list of publications and links can be found at openoptics.info.

Research areas

Engineering Photonics applies advanced photonic technologies to solve challenging measurement problems. Our research underpins measurements across a wide range of industrially important areas such as: aerospace, healthcare, manufacturing, transport, automotive, environment and agrifoods. We work in collaboration with academia, SMEs and major international companies both nationally and internationally.

Technologies

Optical interferometry; optical fibre sensor technology including interferometry, FBGs and LPGs; optical imaging and image processing; optical gas sensing; speckle interferometry and metrology.

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