

VAMAS Technical Working Area 26

Full-field optical methods of stress and strain measurement

Minutes of Meeting held on Monday 10th June 2002

Present: David Backman (Institute for Aerospace Research, Canada); Jaime Cardenas (Texas Tech University, USA); Caroline Dry (University of Illinois, USA); Jose Freire (Catholic University of Rio de Janeiro, Brazil); Dorian Garcia (University of South Caroline, USA); Arthur Jones (University of Nottingham, UK); Yuriq Kudryautsec (ITL Inc, Canada); Jerome Molimard (Ecole des Mines de St Etienne, France); Eddie O'Brien (Airbus, UK); Jean-Jose Orteu (Ecoles des Mines D'Albi, France); Eann Patterson (University of Sheffield, UK) [co-chair]; Fabrice Pierron (ENSAM, France); Masahira Takashi (Aoyama Gakuin University, Japan), Michel Taroni (SNECMA Moteurs, France); Wei-Chung Wang (National Tsinghua University, Taiwan); Satoru Yoneyama (Wakayama University, Japan).

Apologies: Richard Burguete (Airbus, UK) [co-chair]

1 About TWA 26

- 1.1 Eann Patterson gave a brief introduction to TWA26. He described the current environment in which there is an on-going expansion in full-field optical techniques for strain measurement. Many of these techniques are readily applied to complex problems and hence are of potential interest to industry; however, the techniques are not widely known or accepted. Despite the large amount of research, there is only slow technology transfer to industry; and although there is strong industrial interest and support, it comes from limited sectors. The aims of VAMAS were identified as:
 - development of test methods;
 - comparison of test results;
 - production of reference materials;
 - establishment of databases of material properties;
 - agreement of nomenclature.
- 1.2 It was reported that VAMAS encourages collaborative prenormative research, which is co-ordinated through technical working areas (TWA). There is no direct funding, but G7 nations assign funds independently.
- 1.3 The route to standardisation was identified as an enormous project in which there was much to be gained by exploiting the common technology shared by the techniques. International co-operation is important to distribute the labour, reduce duplication of effort, and ensure shared ownership of the standard. The lack of international standards for procedures, materials, and equipment was recognised.
- 1.4 The TWA26 domain of techniques and fields was presented and participants were invited to volunteer to populate the domain by contact Richard Burguete (richard.burguete@airbus.com). Attention was drawn to the VAMAS guidelines, website (www.vamas.org) and the secretariat, as well as the TWA26 website (www.twa26.org) and national representatives.

2 Reports from National Representatives

- 2.1 Mike Sutton reported on the progress with the draft standard guide for terminology for optical strain measurements. Following three revisions, the guide is now the final stage of ASTM approval. A draft version is attached to the minutes. The production of the draft standard guide has been strongly driven by the digital image correlation community in the US, and this grouping is expecting to continue and produce a standard on digital image correlation in three to four years. Work on a round robin using a database for processing is already underway. Participants were invited to join the ASTM meeting on 6th November in Miami at which the progress towards a standard for digital image correlation will be planned. The meeting is being organised by David Johnson from the US Airforce Research Laboratory (David.Johnson1@wpafb.af.mil).

2.2 Satoru Yoneyama reported on activity in Japan. The Stress and Strain Measurement Division of JSNDI has been informed of the TWA26 activity but its members are not interested in participating. JSME-MMD is also unconcerned about standardisation, and there is a similar situation in industry with the exception of the Nuclear Plant Division of Hitachi Co. A Full-field Optical Methods and Standardisation Division has been established within the Japanese Society for Experimental Mechanics (JSEM). Professor Morimoto is chairman of the division and Dr Yoneyama is secretary. A session was organised at the 2001 JSEM Annual conference and a division meeting with the other divisional meetings in October 2001. A special issue on 'Current situation and standardisation of optical methods' was published in the Journal of JSEM vol.2, no.1.

2.3 Eann Patterson reported on the formation of a European consortium consisting on Ettemeyer AG (D), EMPA Dubendorf (CH), Fiat Research Centre (I), Honlet Optical Systems GmbH (D), JRC Ispra (EU), National Physical Laboratory (UK), Optical Metrology Innovations Ltd (IRL), SNECMA Moteurs (F), University of Sheffield (UK), and University of Warsaw (PL). The consortium has the acronym SPOTS (Standards Project for Optical Techniques of Strain measurement). The consortium submitted a proposal to the 5th Framework for research and development of the European Commission, and it has been retained for negotiation. SPOTS has populated a horizontal band in the TWA26 domain and has the following objectives:

- o to develop physical & virtual reference materials that allow traceability, validation, and transparent comparability;
- o to optimise methodologies for full-field optical techniques for strain measurement;
- o to contribute to standardisation activity for full-field optical methods for strain measurement.

These objectives have been translated into the programme of work given below:

- o Development of physical reference materials for speckle techniques, shearography, moiré, moiré interferometry, photoelasticity, and thermoelasticity;
- o Design and construction of simulated, virtual reference materials based on simulated data, synthesised fringe patterns both with and without noise;
- o Identification of routes for traceability for calibration of systems;
- o Definition of recommended data formats for image data, numerical data, and processed data
- o Optimisation of methodologies for the use of unified reference materials and the practical application of the techniques;
- o Interaction with external bodies, including liaison with international standards bodies and dissemination to EU industrial base.

2.4 The SPOTS work programme is divided into five work packages each of which has a leader as indicated below:

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| 1. Project Management | Eann Patterson, University of Sheffield |
| 2. Optimisation of Methodologies | Margorata Kujawska, University of Warsaw |
| 3. Development of Reference Materials | Maurice Whelan, JRC Ispra |
| 4. Verification and Implementation | Hans Richard Schubach, Ettemeyer AG |
| 5. Dissemination Activity | Mariemarguerite Dugand, Fiat Research Centre |

2.5 A three year timetable has been set but the timing will not be decided until the end of the negotiations with the European Commission.

3 Discussion

There was a brief discussion at which participants sought some clarifications of issues presented.

4 Next Meeting

It was reported that the meeting for 2002 had been scheduled for Vienna at the ICEM conference, which had been cancelled and replaced, by a conference in Bari in 2004 at which there will be TWA26 session. Suggestions were sought for a location and time for the 2003 meeting, which it was felt, should be outside of the US given the number of meetings already held there. The IOP/BSSM conference in Glasgow was proposed as a possibility.

Attachments: Draft standard guide on terminology for comparing optical measurements