INTERNATIONAL
DIGITAL IMAGE CORRELATION
SOCIETY

Monday, October 15, 2018 Morning Classes, 9:00 AM to 12:00 PM

Class cost: $150 full day (any two classes) and $75 half day (any one class). www.iDICs.org to register.

Model Validation and Material Identification Via Full-Field Data

COURSE DESCRIPTION

Digital Image Correlation (DIC) is gradually becoming a standard tool in experimental mechanics, for both industry and academia. Despite the fact that the measurement system is often sold with the argument of being easy in use and setup, a poor understanding of issues arising in the whole measurement chain (imaging, noise, correlation algorithm, smoothing, …) can result in poor or misinterpreted results.

In this course, special attention is paid to MatchID 's solutions to material identification and model validation with a quantitative interpretation of the results. In particular, it is illustrated how DIC uncertainties impact the identified properties and final model validation decisions.

Having access to the spatial distribution of strains at the surface of the material via DIC enables the use of more complex test configurations to identify the mechanical behavior of materials via the Virtual Fields Method (VFM). This method is now fully integrated into MatchID 's analysis platform allowing a seamless coupling with DIC data. This method is an alternative to Finite Element Model Updating over which it has a number of specific advantages, among which much shorter computation times. Both linear and non-linear model examples will be included. It is demonstrated how DIC's resolution and spatial resolution might influence the final identified material properties. A methodology is presented to both evaluate the measurement performance and to optimize the test setup.

The workshop is led by Dr. Pascal Lava from MatchID – Metrology beyond colors, Belgium. He brings a wealth of experience in the practical application/data analysis of DIC and the identification of mechanical material properties.
www.matchid.eu

In a second slot, the above mentioned concepts are then adopted to get an intuitive feeling on how MatchID approaches the validation of an FEA model. The methodology relies on the use of synthetic speckle image deformation to produce validation maps of finite element models from DIC data. The underpinning novelty is the fact that it takes into account the filtering effects of DIC, which according to MatchID, is a compulsory step to obtain robust validation. Again, the ideas are outlined based on practical examples with a clear demonstration of MatchID 's finite element validation module.

The principal goal of this workshop is not to provide a detailed theoretical study on DIC, VFM and FEA validation, but to focus on possible problems and general concepts via practical examples and how this is all integrated within MatchID.

WHO SHOULD ATTEND

Practitioners of DIC at post graduate level working in both academia and industry. In addition, engineers and researchers who have an interest in the use of full- field strain measurements to extract mechanical properties of materials or validate FEA models. Basic knowledge of DIC is required.

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How to Pattern … Everything

COURSE DESCRIPTION

Patterning is an essential part of every digital image correlation test setup. Although most users do avoid the worst-case scenario of "garbage in, garbage out" when it comes to patterning, there still seem to be a lot of non-optimum techniques and results in practice. Many users have concerns about their ability to produce high quality patterns without a lot of struggle, or a degree in Art. However, there are simple guidelines and methods that enable patterning to be a fast, easy and repeatable process, with straightforward quality metrics.

This course will cover everything you need to know to confidently and quickly prepare any specimen for a DIC test, and be sure that patterning will not be the limiting factor for obtaining the highest quality data.

COURSE CONTENT

- The Golden Rules of Patterning
- Patterning for the Most Common Test Setups
- Removing Human Factors from Patterning
- Pros and Cons of Spray Paint, Ink, Rubber Stamps, Airbrushes, Markers….
- Masking How's and Whys
- Pre-Test to Check Your Pattern (And Everything Else, Too)
- (System Noise as Opposed to DIC Noise)
- The Ideal Pattern vs The Real World
- What to Do When Larger Dots Are Required
- Evolution of Various Patterning Methodologies
- Small-Scale and Microscale Patterning Techniques
- What About Naturally Occurring Patterns?
- High Temperature and Very High Temperature Patterning
- Some Lighting Techniques – How to Make Your Patterns Look GOOD

And

- Most Common Beginner's Mistakes
- Bad Ways to Do Good Patterns
- Fantastic Examples of Terrible Patterning

WHO SHOULD ATTEND

It is hoped that all current or potential users of DIC would benefit from this course.

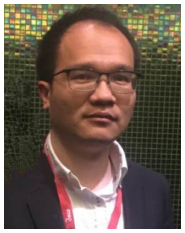
The workshop is led by Mr. Tim Schmidt from Trilion Quality Systems – schmidt@trilion.com

Tim Schmidt, Vice President of Trilion Quality Systems, is one of the most experienced practitioners of 3D image correlation and point tracking photogrammetry in the world, particularly for field tests and high speed camera applications. Tim has run tests on days, nights and weekends for more than 15 years. He has given Basic, Refresher and Advanced training to hundreds of DIC users, and provides worldwide support for challenging measurements.

INTERNATIONAL DIGITAL IMAGE CORRELATION SOCIETY

Monday, October 15, 2018 Afternoon Classes, 1:00 PM to 4:30 PM

An Introduction to GOM Correlate: GOM Correlate软件介绍



杨新，道姆光学科技（上海）有限公司

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GOM Correlate enables the evaluation of 2D and 3D image series for digital image correlation and motion analysis using point markers.

This course gives an introduction into the workflows for 2D and 3D applications including image import and processing, measurement inspection and reporting.

Important settings for image sampling and filtering will be discussed as well as their influences on the measurement results.

The impact of different sampling settings for 2D/3D coordinates, displacements and strains (virtual strain gauge length) will be discussed at the example of a tensile test and

a reinforced plastic component. This course will be held in Chinese language.

Monday, October 15, 2018 Afternoon Classes, 1:00 PM to 4:30 PM

DIC User Variables and Data Optimization Overview

The workshop is led by Mr. Tim Schmidt from Trilion Quality Systems – schmidt@trilion.com

Tim Schmidt, Vice President of Trilion Quality Systems, is one of the most experienced practitioners of 3D image correlation and point tracking photogrammetry in the world, particularly for field tests and high speed camera applications. Tim has run tests on days, nights and weekends for more than 15 years. He has given Basic, Refresher and Advanced training to hundreds of DIC users, and provides worldwide support for challenging measurements.

COURSE DESCRIPTION

Although there are numerous commercial, University and DIY DIC codes, the fundamental computation accuracy, pattern matching principles, and therefore best practices, are quite similar. We are starting with pictures of patterned objects, and generating a series of 3D point clouds. The key to optimum results, assuming a high quality experimental setup with excellent patterning, calibration, and lighting, is a strong understanding of the DIC user variables.

This presentation will review the four primary user variables of DIC – subset size, subset step (point spacing), strain gauge length, and smoothing (filter) settings. What are the default values, and why? When might it be beneficial to change these default settings? How can you tell whether the virtual strain gauges are too short, or too long? What are the recommended best practices to assess and reduce noise in DIC measurements? Practical examples from several common types of DIC tests will be shown, comparing initial and optimized data.

COURSE CONTENT

Upon completion of a successfully conducted high quality test, with optimum calibration and patterning, the project file is then ready for detailed analysis and reporting. DIC has powerful features and benefits, such as the ability to vary lateral resolution, virtual strain gauge length, spatial and temporal filters, and alignment of the coordinate system relative to the test object. It is essential for DIC users to be aware of default user variable settings and when it might be optimum to change them, as well as typical noise sources and how to assess and eliminate them. This course will review good practices for obtaining optimum quantitative and visual DIC data.

- Specific topics to be thoroughly covered include:
- Subset Size – Default Settings, when to Enlarge, Minimum Practical Size
- Subset Overlap/Point Spacing – Your Direct Control of Lateral Resolution
- Virtual Strain Gauge Length – Displaying and Calculating
- Most Common Noise Sources and How to Eliminate Them
- Pre-Test to Determine Static Noise
- Median Spatial Filtering to Eliminate Outlier Data Points
- Time Domain Filtering
- Coordinate System Awareness and Setting
- Sometimes Bad Strains Happen to Good Displacements
- DIC Noise vs System Noise
- Noise, Repeatability and Accuracy Assessment
- IS DIC a Trusted Instrument?
- The Visual Truth
- Quiz Questions and Answers
- How to See That Results Are Noisy, From Very Far Away
- How to Check for Over-Smoothed Data

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Expert Panel Discussion: Free to all iDICs registered attendees
Monday, October 15, 2018 Evening, 5:00 PM to 6:30 PM

Good and Bad DIC Practices and Recognizing the Difference

Moderators: Mark Iadicola (NIST) and Phillip Reu (Sandia National Laboratories)

Panelists: Pascal Lava (MatchID), Hubert Schreier (CSI), Tim Schmidt (Trilion/GOM), Thorsten Seibert (Dantec Dynamics), Elizabeth Jones (Sandia National Laboratories), Stéphanie Jaminion (CorreliSTC), Markus Klein (GOM)

COURSE DESCRIPTION

Digital Image Correlation (DIC) is a powerful full-field measurement technique that uses one or more digital cameras to acquire images of a sample and then software to analyze the images to calculate displacement and strain. DIC has been widely adopted in academia, industry and national laboratories as an important engineering measurement. Because of the power and flexibility of DIC, there are many decisions that must be made in setting up the experiment and then analyzing the results. A fundamental goal of iDICs is to "improve our practice" of DIC by better understanding these experimental trade-offs. As with any complicated topic there are areas of strong agreement and some disagreement between experts on the "best" approach to making a quality DIC measurement. As a basis for beginning the discussion, the seminar will begin with the newly completed "DIC Good Practices Guide" authored by the iDICs Standardization, Best Practices, and Uncertainty Quantification Committee. This document presents a consensus view on good practices for quasi-static stereo-DIC measurements. The moderators and panelists will discuss these topics and answer audience questions related to DIC good practice. The panel, all with deep practical DIC experience, will then share their opinions on a wide variety of DIC topics solicited from the iDICs attendees including:

- Unconventional DIC systems,
- Checking calibrations,
- Stereo-angle selection,
- Painting and speckling issues,
- And any audience questions.

Please join us for an exciting and lively discussion of any and all DIC topics.