

Newsletter 2022/1

Expanding while innovating

We are proud to present our latest newsletter that comes with a variety of positive news. At the beginning of 2021 MatchID, like many companies, was worrying about the impact of the pandemic on its business. These concerns appeared to be entirely unjustified. Whereas in 2020 we could report an *exceptional* growth of 38% on turnover, margins and licenses, 2021 gifted us with an even larger increase of 55%.

This is a clear testimony of the growing maturity of our spin-off company, the market potential and the market gap we jumped into. Indeed, apart from our regular sales channels, MatchID was very successful in a range of tender applications, mainly due to the integration of our solutions with material identification and model validation tools. This gives us great confidence that our initial vision for founding MatchID is confirmed by the market.

Accordingly it is time to gradually shift from the startup to the scaleup stage. Investments will be made in multiple areas, from an increased workforce to a broader range of hardware and software solutions. It is crucial, however, that this growth does

not impact our well-recognized support and training services nor influences the primary ambition of the company, *i.e.* improving the state-of-the-art of DIC technology and playing a pioneering role in the DIC platform of the future where integration with design and simulation is a fundamental objective.

In that perspective, an internal R&D branch has been setup operating in close collaboration with our product development line. This will solidify MatchID as a valuable R&D partner to help our customers realize the full potential of the wealth of data and opportunities provided by our tools.

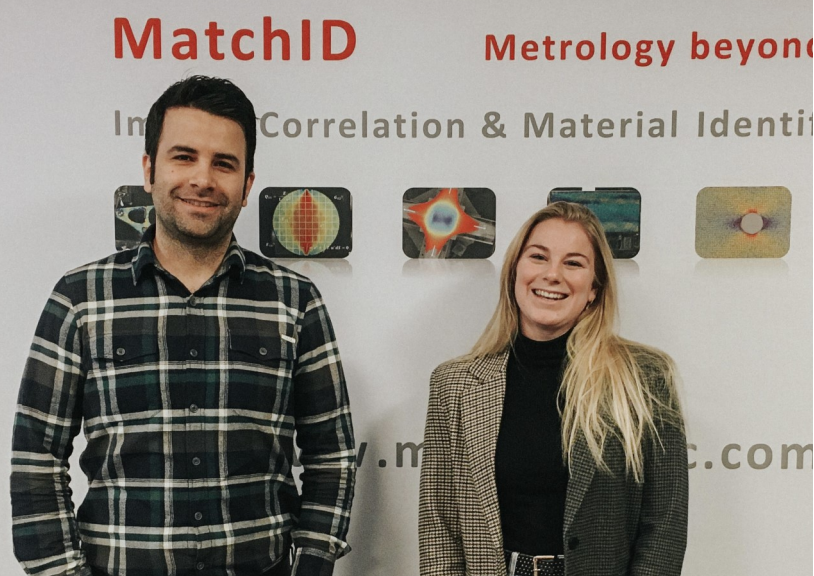
More details about our R&D mission statement, projects and vacancies can be found further on. On top, please take a glance at the novel features implemented in our latest release and discover how colleagues in Portugal adopt the entire MatchID solution stack to identify material properties of wood!

All the best for 2022 and looking forward to meeting in person again!

-The MatchID Team

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MatchID is expanding! We are constantly building the future. Recently Vahid Firouzbakht and Jiense Tanghe joined our team.

MatchID 2022.1

what's new?

MatchID 2022.1 is out now! We are thrilled to present you a range of new features, resulting from 6 months of exciting work.

Improved data file format

New protocol with full backwards compatibility. Up to 10 times faster writing and reading.

New local spline interpolant

Consumes less RAM and has a better calculation speed performance with guaranteed equal accuracy.

Compact file import

Direct import of compact Phantom *.cine, Photron *.cixh and iX *.sequence files.

Temperature data integration

Synchronized integration of temperature data via *.thermal files.

Cylindrical coordinates

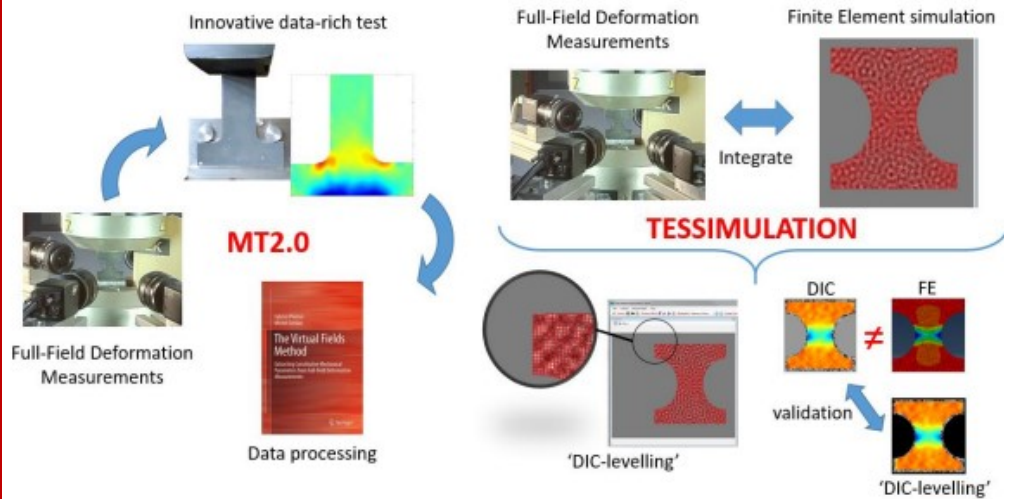
Cylindrical coordinates for displacements and strains.

Non-parametric distortion

Polynomial calibration for non-parametric distortion models

Flir cameras Integration

Integration of Flir Oryx cameras (10GigE) and Flir A615 infrared cameras.



Two examples of new engineering methodologies based on DIC: Materials Testing 2.0 and "Tessimulation"

A glance at the (near) future

At present, material testing is still mostly performed through standards developed for extensometers or strain gauges, using simple geometries with statically determinate stress states. These tests provide a limited amount of information per test and lead to the need for a large number of tests to calibrate a given material model.

There is no doubt that the next generation of mechanical tests of materials will rely on DIC. But to get there, new test configurations will be needed where shape and loading are not constrained by the need for an *a priori* stress distribution anymore. This was recently coined "**Materials Testing 2.0**" [1] (above Figure, left).

Another important area where DIC is bound to bring a revolution is the validation of engineering designs through structural testing. DIC provides spatially-dense data that are a match for simulations but the tools to integrate both in a single streamlined procedure are still missing. This integration, christened "**Tessimulation**" for want of a better word, is illustrated in the above Figure, right. Through the years, MatchID has developed dedicated tools to 'push' the simulation data through the same filter as the DIC one to allow for a fair comparison of the data independently from the choice of the many DIC parameters like subset size, shape function and strain window [2]. In the future, DIC will certainly be integrated with both CAD (to design the experiment itself) and Finite Element packages to ensure a seamless flow of data between the different facets of the design.

MatchID has the ambition to play an active part in the elaboration of these new engineering methodologies based

on DIC. Accordingly, we are delighted that Dr. Fabrice Pierron is joining our team as R&D Director. In the coming years, we are hoping to develop a strong R&D

"Our ambition is to be a valuable R&D partner to help our customers realize the full potential of their DIC system."

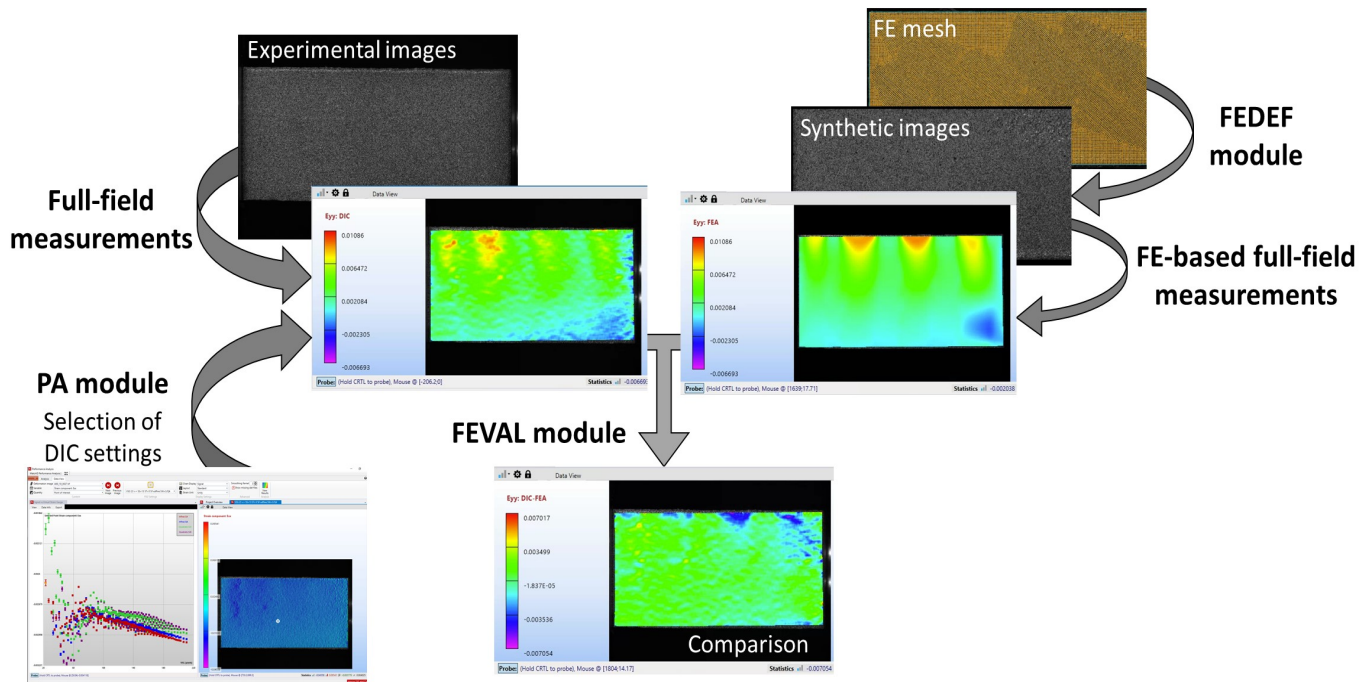
Dr. F. Pierron - R&D Director



department in close collaboration with our customers and partners to advance the use of camera-based deformation measurements in engineering. Our ambition is not only to be a leading software provider for the next generation of DIC-based engineering, but also a valuable R&D partner to help our customers realize the full potential of the wealth of data and opportunities provided by our tools. Our unique blend of expertise ranging from DIC algorithms and hardware integration to innovative use of DIC measurements in engineering makes us an ideal partner to work with industry and academia to bring this vision to reality. So do not hesitate to contact us if you have a project in mind.

[1] Pierron F., Grédiac M., Towards Material Testing 2.0. A review of test design for identification of constitutive parameters from full-field measurements. Strain, vol. 57, n° 1, e12370, 2021

[2] Lava, P., et al., Validation of finite-element models using full-field experimental data: Levelling finite- element analysis data through a digital image correlation engine. Strain, 2020. 56(4): p.e12350.



The Research Team of the NOVA University's Department of Mechanical and Industrial Engineering, Portugal, adopts the full stack of MatchID's data enriching modules to identify material properties of wood.

Application in the picture: model updating on wood

An inverse identification strategy is proposed at the NOVA University Lisbon to identify orthotropic linear elastic constitutive parameters of *Pinus Pinaster Ait.* wood through the Finite Element Model Updating (FEMU) method. The approach is validated using both direct FE and FE-based synthetic image data. In the latter, a synthetic image reconstruction approach based on the Digital Image Correlation (DIC) filter is carried out on synthetic images deformed according to a 2D FE model. The full-field measurements obtained from the synthetic images are compared with the experimental measurements and used to identify the four orthotropic material parameters on the radial-tangential (RT) plane with suitable accuracy.

MatchID has been the perfect tool to carry out these analyses. Due to the complex behavior and inherent heterogeneity of wood, strain maps are typically affected by local gradients generated by the morphology of earlywood and latewood tissues in the transverse plane. The Performance Analysis Module (PA) of MatchID allows to fine-tune DIC settings in view of the compromise between spatial resolution and noise associated with the measurements.

"The MatchID FEVAL tool is a crucial step in the right direction for a digital twin approach and accurate material identification."

J. Henriques, J. Xavier - NOVA University Lisbon

A. Andrade-Campos - University of Aveiro



Moreover, the FEMU approach could be enhanced by the virtualization of the test. The proposed methodology is based on the reconstruction of synthetic speckled images, which are deformed based on the prediction imposed by the FE model, using the FE Deformation Module of MatchID (FEDEF). Afterwards, the MatchID FE Validation Module (FEVAL) is used to process the synthetic images with DIC. This tool is a crucial step in the right direction for a digital twin approach for the identification of the material parameters.

Nova School Of Science and Technology, Universidade NOVA de Lisboa, www.fct.unl.pt

Sim-Icon RESONAM project

We are happy to announce our involvement in a recently approved Flemish Sim-Icon project entitled

“Resonant-based material characterization for metal Additive Manufacturing”

also involving Materialise, Siemens Industry Software, KU Leuven and University Gent. This 3-year project will study the mechanisms and origins of variability in AM part quality. The effect of modifying printing conditions on the AM material will be investigated with vibrational NDT techniques as well as with various traditional material characterization techniques (metallography, X-CT, ...). The developed framework will lead to a faster qualification of print process parameters as well as to a better AM material qualification.

A key objective of MatchID here is to turn DIC into an essential toolbox for a continuously expanding AM market.

Vacancy

MatchID is looking for a control and hardware-integration engineer interested in optical deformation measurement techniques.

Can you program, implement and test a wide range of new camera models into our platform? Optimize and develop custom hardware solutions? Provide ideas for the future development roadmap? Cooperate with partners, customers, universities & research labs in technical discussions, reviews and technology evaluations?

Then you might be the engineer we are looking for! Send us your motivation letter and CV today, before someone else steals this great opportunity from you!

Meet MatchID at:

Tips & Tricks (T&T): short 20 min sessions to improve your MatchID product knowledge:

- T&T 2022/1 : Triggering options in MI-Grabber, February 2 at 4pm CET.
- T&T 2022/2 : VFM module, March 2 at 4pm CET .

Webinars: a 45 min-journey to a specific MatchID product illustrating its capacities towards a large range of applications:

- Webinar 2022/1: The Virtual Fields Method (VFM) and Material Testing 2.0, February 23 at 4pm CET

Send an email to registration@matchid.eu to register for these events.

Conferences and Expositions:

- IMAC XL February 7-10 in Orlando, Florida USA
- ESAFORM 2022 April 27-29 in Braga, Portugal
- EMMC18 April 4-6 in Oxford, UK
- IDDRG 2022 June 6-10 in Lorient, France
- SEM Annual 2022 June 16-16 in Pittsburgh, Pennsylvania USA

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Metrology Beyond Colors Newsletter 2022/1

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Metrology beyond colors