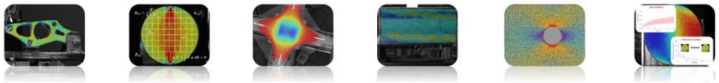
R&D Mission Statement

Ref. 20211001
30 September, 2021



A word from the new R&D Director
Dr Fabrice PIERRON

I am delighted to announce that I have now joined MatchID as R&D Director and look forward to my new role. I would like to take this opportunity to share some thoughts with you about the future of Digital Image Correlation (DIC) and associated tools.

In a way, one could say that DIC is now a mature technology. It is rather widespread in testing labs and the recent Guide of Good Practice from the International DIC Society [1] provides a strong basis for an informed and robust use of DIC. However, the engineering practices that would take full advantage of this powerful tool are still largely to be established.

For instance, 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” (illustrated in Figure 1, left) as it was felt that a new expression was needed to materialize the concept, though maybe better names could be found [2]. There is a lot of work ahead of our community to develop these new tests and eventually bring them to standardization, and MatchID has the ambition to play an active part in this process. One route to standardization could be through VAMAS[1] where an MT2.0 Technical Working Area (TWA) group is currently being explored.

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. There are many challenges to be overcome as test and simulations ‘live’ in different worlds. This integration, which I have christened “Tessimulation” for want of a better word, is illustrated in Figure 1, right. 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 [3]. 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. Again, MatchID is actively working towards this goal.

[1] http://www.vamas.org/

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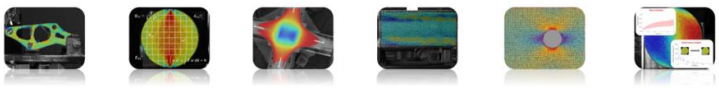

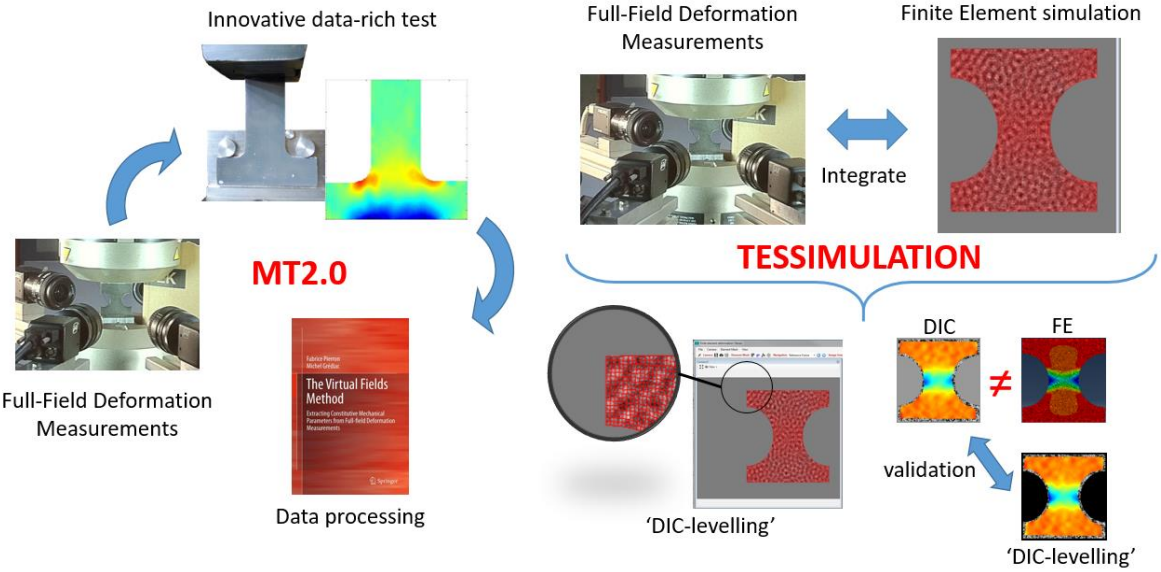

Figure 1 – Two examples of new engineering methodologies based on DIC: Materials Testing 2.0 and "Tessimulation"

Finally, there are opportunities for image-based measurements to expand beyond the current state of the art of DIC. An interesting example for instance is deflectometry [4] which could be a very attractive complement to DIC for small deformation, with the benefit of not needing to pattern the examined surface.

In the coming years, we are hoping to develop a strong R&D department in close collaboration with our customers and partners to advance the use of camera-based deformation measurements in engineering, among the lines of the vision statement above. 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.

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References

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2. Pierron, F. and M. Grédiac, *Towards Material Testing 2.0. A review of test design for identification of constitutive parameters from full-field measurements.* Strain, 2021. **57**(1): p. e12370.
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4. Toniuc, H. and F. Pierron, *Infrared deflectometry for surface slope deformation measurements.* Experimental Mechanics, 2019. **59**(8): p. 1187-1202.