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Fractional calculus: theory and numerical methods*

Editorial

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This issue represents a contribution to a panoramic view of the Fractional Calculus through a large spectrum of possible applications in different experimental scenarios. The included papers show the modelling potentiality of the Fractional Calculus as well as a vision of the associated many open fractional questions which deserve deeper studies and developments. A complete development of the Fractional Calculus similar to the Classical Calculus is still not achieved. They are many open questions and we could say that, at this moment, the limits exist in the imagination.

The Fractional Calculus is a suitable instrument to model non local phenomena either in space and/or in time. In many contexts the underground dynamics of the system depends either on its history and/or the environment. On the other hand, the Fractional Calculus provides a suitable instrument to analyse possible interpolating dynamics between the properties and dynamics characteristics of the integer derivatives. A relevant reference case is the possible interpolations between the classical diffusion and wave equations through the fractional derivative in time.

As we know the definition of fractional derivative is not unique, a basic constraint is to reproduce the established results for the integer case. It makes the Fractional Calculus a very powerful tool because it can be implemented to model a wide set of phenomena.

This issue includes papers dealing with basic questions as the fractional chain-rule to different contexts of applications modelled by ordinary and partial differential equations. Also numerical studies are included. We hope that this topical issue would be very stimulating and helpful for young researchers and Ph.D. students who are the basic vectors for the future developments of the Fractional Calculus.

Finally, we thank to Dr. Krzysztof Malarz, Managing Editor, for the opportunity to prepare this topical issue.

*"Fractional calculus is the calculus of the future, with it, we can solve problems we couldn't have solved before.", Om P. Agrawal

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