NUMERICAL COMPUTATION OF FRACTIONAL OPERATORS FOR SMA MODELING

J. A. Arakama[1], M. Mateos[1,2] and J. Aurrekoetxea[1]

[1] Departamento de Mecánica y Producción Industrial
Escuela Politécnica Superior de Mondragón Unibertsitatea
Loramendi 4, 20500 Mondragón, Spain
e-mail : jaarakama@mondragon.edu
[2] Institut de recherche en Gnie Civil et Mcanique (GeM) UMR CNRS 6183
Ecole Centrale de Nantes
1 Rue de la No, BP 92101, 44321 Nantes Cedex 3, France

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Models based on fractional operators have proved to be valid for modelling those materials which show hysteretic behaviour, such as Shape Memory Alloys.

Due to the non-locality of fractional integral and differentials operators, it is necessary to know the value of the function that is being differentiated or integrated in the previous points. Therefore, it is possible to state that fractional operators have memory in time and are suitable to model precisely the systems that are time evolving.

In order to implement these operators in Finite Element models and due to constant time increment requirements when numerically evaluating, a large amount of points are needed as time evolves and therefore both the store and computational storage increase drastically.

The objective of this work is to develop a new computational method to address the aforementioned drawbacks, by storing fewer points when evaluating these fractional operators without decreasing the accuracy of the model.

The efficiency of the scheme has been analysed and some examples are presented to show the ability of the new method.