



ESAFORM Webinar Series 2023

Fibre (mis) orientation identified via XCT and structure tensor-based image analysis

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Date/time: 20 September 2023 / 15:00 CET

Registration link, in advance for this meeting:

<https://videoconf-colibri.zoom.us/meeting/register/tJcvduyspjkpGN04rxJFsXioDP7LFztqYwYY>

Abstract

Last decade saw a rapid growth of μ CT applications for and textile composites, which followed the fast development of the μ CT hardware. Beautiful 3D images, however, are not used in full as the virtual representation of the internal structure of textiles and textile composites because the voxel structure of the image lacks directionality, which is the paramount local characteristic of fibre reinforced composites and fibrous assemblies. Also directionality provides additional image feature for segmentation, together with grey scale values of the image voxels.

Local directionality information can be retrieved using analysis of local **structure tensor**. The processing results in a voxel 3D array, with each voxel carrying information on (1) material type (matrix; yarn/ply, with identification of the yarn/ply in the reinforcement architecture; void) and (2) fibre direction for fibrous yarns/plies. The knowledge of the material phase volume and known characterisation of the textile structure allows assigning to the voxels (3) fibre volume fraction. With this basic voxel model built, it can be employed for characterisation of fibre (mis) orientation and further used for different type of the material analysis. The webinar discusses use of structure tensors in different situations, based on publications of the presenter (VoxTex software) as well as on work in other groups.

Biography **Stepan V. Lomov**



1955 born in Leningrad
1972 **30th Physics & Mathematics School**, Leningrad
1978 **Leningrad Polytechnic Institute** (St.-Petersburg State Polytechnic University), Physics & Mechanics Faculty, Chair of Applied Mathematics; Dipl. Engineer-Mathematician (*magna cum laude*)
1978 – 1989 **Federal Research Institute of Transportation Machinery**, Leningrad: Researcher, senior researcher (**terminal ballistics**)
1985 Candidate of Technical Science (equivalent to PhD degree)
1989 – 2000 **St.-Petersburg State University of Technology and Design**: Senior researcher, professor (**mechanical technology of fibrous materials**)
1995 Doctor of Technical Science (Doctor Habille) in Textiles Material Science
1994 – 1998 **De Montfort University**, UK, Visiting researcher
1999 – 2020 **KU Leuven**, Belgium: Visiting professor, Research associate, Research Manager (**composites material science**)
2013 – 2020 Coordinator, Composite Materials Group
2013 – 2021 Toray Professor (Toray Chair for Composites, KU Leuven)
2002 – present Professor, Professor Emeritus, **KU Leuven**
2013 – present collaboration with **Skoltech**, Russia

