Invite Speech

SATURDAY, 16 November 2019

TIME: 17:15-17:35

ROOM: MEETING ROOM 1+2

DIGITAL TWINS AND IMAGE ANALYSIS FOR THE MORPHOLOGICAL CHARACTERIZATION OF GRANULAR MEDIA

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Abstract: Industrial processes involving granular media (population of particles: powders, crystals, fibers, etc.) are numerous and present in various industrial contexts (pharmaceuticals, nuclear, materials, agronomy, etc.). The geometric characterization of such particles has always been an issue, either to improve knowledge or to control the process with online property measurement if possible.

For this purpose, the acquisition of 2-D images allows a direct visualization of the projected particles that needs to be exploited. One of the major problems is the superposition of particles, a consequence of the projected view.

From such data, advanced image processing and analysis methods can be used to individualize and characterize particles (size, shape, spatial dispersion, etc.). However, these methods are not very effective when the granular medium is dense enough.

To overcome this limitation, methods based on random (or stochastic) geometry provide digital twins to model and characterize these images of granular media. Synthetic images of granular media are simulated and statistically fitted to real data. The morphological characterization of the particles is then indirectly accessible.

These different advanced methods of image analysis and stochastic geometry therefore provide digital tools for characterizing the morphology of granular media (a task that is generally difficult to perform with conventional methods). Our work should therefore lead to new online characterization tools, based on images processed by new algorithms that provide additional information to traditional methods, including shape factors.

Bio: Professor Johan Debayle: he received his M.Sc., Ph.D. and Habilitation degrees in the field of image processing and analysis, in 2002, 2005 and 2012 respectively. Currently, he is a Full Professor at the Ecole Nationale Supérieure des Mines de Saint-Etienne (ENSM-SE) in France, within the SPIN Center and the LGF Laboratory, UMR CNRS 5307, where he leads the PMDM Department interested in image analysis of granular media. In 2015, he was a Visiting Researcher for 3 months at the ITWM Fraunhofer / University of Kaiserslautern in Germany. In 2017 and 2019, he was invited as Guest Lecturer at the University Gadjah Mada, Yogyakarta, Indonesia. He was also Invited Professor at the University of Puebla in Mexico in 2018 and 2019. He is the Head of the Master of Science in Mathematical Imaging and Spatial Pattern Analysis (MISPA) at the ENSM-SE.

His research interests include image processing and analysis, pattern recognition and stochastic geometry. He published