Augmented Lagrangian Method for Image Processing by Piecewise Constant Level Set Method

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Rationale: Image science is used to denote a widely range of problems related to digital images. It is generally referred to problems related to image processing, computer graphics and computer version. The type of mathematical techniques involve range from discrete math, linear algebra, statistic, approximation theory, PDEs, quasi-convexity analysis and even algebraic geometry.

Tools: Level set methods for image processing often relate to PDEs techniques involving one or more of the following features: 1) regarding an image as a function sampled on a given grid with the grid values corresponding to the pixel intensity in suitable color space; 2) regularization of the solutions; 3) representing boundaries; 4) the numeric developed for the level set methods.

Applications: We use piecewise constant level set method (PCLSM) to segment images (may be corrupted by noise and blurred) in order to get the boundary of the image. New model is presented and numerical experiments show that PCLSM is a novel method and can segment image efficiently. PCLSM can be applied to the ‘History matching problem’. By this tool, we can find the reservoir characterization using a regularization technique. Experiments show that it can recover the reservoir characterization stably and efficiently.

Speaker Biography

Dr. Yao is a Vice Professor of Department of Mathematics, Zhengzhou University, Zhengzhou City, P.R. China. He received a Master from Department of Mathematics, Zhengzhou University in 2003 and PhD from the Institute of Computational Mathematics and Scientific/Engineering Computing of Chinese Academy of Sciences (CAS) and from Department of Mathematics, Centre for Integrated Petroleum Research (CIPR), University of Bergen, Norway in 2008. He works on image processing, dynamic reservoir model and computational electromagnetic by finite element methods from 2005.

Host: Prof Tai Xue-Cheng, Division of Mathematical Sciences, School of Physical and Mathematical Sciences