

State Space Realization of a 3D Image Set with Application to Noise Reduction of Fluorescent Images

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Abstract:

A new method is presented to calculate state space realizations of a three-dimensional (3D) image set. It is based on interpreting the image set as the impulse response of a 3D separable system. The proposed realization algorithm consists of two parts:

- 1.) Decomposition of a 3D image set into the product of three 1D components;
- 2.) Balanced state space realizations of finite 1D sequences.

The proposed method can be used for realizing the given 3D images exactly or approximately. The advantage of the method is noise can be reduced with little degradation on the image quality. It has been successfully applied in noise reduction of various 3D image sets of fluorescently labeled cells acquired by a fluorescent microscope. It can be used for noise reduction in a 3D image set or for noise suppression of a point spread function (PSF) which is an essential component in any 3D deconvolution algorithms.

Biography:

Zhiping Lin received the B. Eng degree from South China Institute of Technology, China in 1982, and the Ph.D. degree from the University of Cambridge, England in 1987. Subsequently, he worked as a postdoctoral researcher at the University of Calgary, Canada. He was an associate professor at Shantou University, China from 1988 to 1993, and a senior engineer at DSO National Laboratories, Singapore from 1993 to 1999. Since Feb. 1999, he has been an associate professor at the School of EEE, Nanyang Technological University (NTU), Singapore. He is currently serving as the Program Director of Bio-Signal Processing, Center for Signal Processing, NTU.

Dr. Lin was an editorial board member from 1993 to 2004, a guest editor for the special issue on "Applications of Grobner bases to multidimensional systems and signal processing" in 2001, and a Co-Editor since 2005, all for the Journal of Multidimensional Systems and Signal Processing. He has been an associate editor for the Journal of Circuits, Systems and Signal Processing since 2000. He is currently serving as the Chair of the IEEE Circuits and Systems (CAS) Singapore Chapter. Dr Lin is a member of the Digital Signal Processing Technical Committee (TC) and the Life Sciences Systems and Applications TC of the IEEE Circuits and Systems Society. He has served in organizing/technical committees of various international conferences, including Program Co-Chair of ICICS 2001, General Vice-Chair of IEEE ICICS-PCM 2003, and Finance Chair of IEEE APCCAS 2006. He is serving as an IEEE CAS Society Distinguished Lecturer for 2007-2008. His research interests include multidimensional systems and signal processing, array signal processing and biomedical signal processing.