In: Computer Vision and Robotics
Editor: John X. Liu, pp. 27-47

ISBN 1-59454-357-7
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Chapter 2

SVD AND MATRIX POLYNOMIAL INTERPOLATION FOR LOSSY PROGRESSIVE TRANSMISSION OF 3D IMAGES*

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Abstract

This paper presents a new method for progressive transmission of 3D images that has four components: (1) decomposition of the image into regions using Singular Value Decomposition (SVD), (2) a reconstruction algorithm for progressive rendering that uses matrix polynomial interpolation along with approximations which are derived from SVD, (3) exploitation of a matrix norm for analyzing goodness of approximation, and (4) an optimal adaptive strategy for selecting "the next region to transmit".

SVD of matrices is used in some areas of image processing, such as restoration, but not usually in transmission. For an image (matrix) of size $m \times n$, its SVD produces an $m \times m$ matrix, an $n \times n$ matrix, and a vector of size $\min\{m,n\}$. That is, the SVD generates more than double the amount of original data. Despite this fact, however, a design of an appropriate adaptive transmission strategy within this four-component procedure provides an algorithm, for lossy progressive transmission, with excellent rendering and computational performance at low percentages of data transmission.

*This research has been supported by the Spanish Ministerio de Ciencia y Tecnología and FEDER grant TIC2002-02249, the Generalitat Valenciana grant GV04B/483, the Natural Sciences and Engineering Research Council and the Multiple Sclerosis Society of Canada, and the Seaman Family MR Research Centre in Calgary, Canada.

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