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Progressive Transmission of Images: PC-Based Computations, Using Orthogonal Matrix Polynomials

E. DEFEZ AND A. HERVÁS
Universidad Politécnica de Valencia, Valencia, Spain

A. LAW
University of Waterloo, Waterloo, Ontario, Canada

J. VILLANUEVA-OLLER AND R. J. VILLANUEVA
Universidad Politécnica de Valencia, Valencia, Spain
rjvillan@mat.upv.es

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Abstract—Two methods for reconstructing a 3-D image as its 2-D parallel slices are transmitted progressively, in some order, are presented and analyzed. In the originating data base, an ordered set of 2-D slices could represent computer tomography (CT), magnetic resonance images (MRI), or cryosection cross-sections of a 3-D object, for example. With this digital formulation, matrix interpolating polynomial machinery renders a progressively-improving image as slices are received. A piecewise matrix polynomial reconstruction is also considered for reducing computational needs.

Keywords—Progressive transmission of images, Matrix orthogonal polynomials, Piecewise matrix polynomials interpolation, Matrix polynomial reconstruction, Rendering.

1. INTRODUCTION

The increasing use of different types of imaging for medical diagnosis has created a need for efficient compression (storing and transmission) and visualization (reconstruction) techniques. In a conventional way of viewing an image, the content is not revealed until the transmission is almost over. In the progressive transmission mode, the resolution of an image increases gradually according to the amount of data accruing. When the image data size is high compared to the speed of the transmission or to the bandwidth of the communication channel, progressive transmission plays an important role in viewing the image. Since the image can be viewed progressively, a high degree of effective compression ratio may be achieved by not transmitting the rest of the data when the image turns out to be of no interest [1,2]. Or, during transmission viewing, if some feature is emerging as important, the receiver could interact with the transmission process and request contiguous information immediately.

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