ROI-based procedures for progressive transmission of digital images: A comparison

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Abstract

Nowadays, problems arise when handling big-sized images (i.e. medical image such as Computed Topographies or satellite images) of 10, 50, 100 or more Megabytes, due to the amount of time required for transmiting and displaying, being this time even worse when a narrow bandwidth transmission media is involved (i.e. dial-up or mobile network), because receiver must wait until the entire image has arrived. To solve this issue, progressive transmission schemes are used. These schemes allow image sender to encode the image data in such a way that it is possible for the receiver to perform a reconstruction of the original image since the very beginning of transmission. Despite this reconstruction being, of course, partial, it is possible to improve the reconstruction on the fly, as more and more information of the original image is received. There are many progressive transmission methods available, such as it planes, TSVQ, DPCM, and, more recently, matrix polynomial interpolation, Discrete Cosine Transform (DCT, used in JPEG) and wavelets (used in JPEG2000). However, none of them are well suited, or perform poorly, when, in addition to progressive transmission, we want to include also ROIs (Region Of Interest) handling. In progressive transmission of ROIs, we want not only to reconstruct the image as we receive image data, but also be able to select which part or parts of the emerging image we think are relevant and want to receive first, and which part or parts have no interest. In this context we present an algorithm for lossy adaptive encoding based on singular value decomposition (SVD). This algorithm turns out to be well suited for progressive transmission and ROI selection of 2D and 3D images, as it is able to avoid redundancy in data transmission and does not require any sort of data recodification, even if we select arbitrary ROIs on the fly.

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