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DIAGNOSTIC PATHOLOGY

ORAL PRESENTATION

Changes of texture features due to image compression

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Background

The digitalization of histologic or cytologic slides followed by computerized image analysis is becoming more popular due to technical advances in virtual microscopy and telemedicine. Because of the high information content of a digitalized slide, the application of compression methods is often a necessary step in order to reduce storage or bandwith requirements, but image compression is usually accompanied by a loss of information.

Our aim was to investigate to which extent image compression according to the JPEG2000 standard is provoking alterations of image texture features.

Methods

For our study we used 8-bit-gray value bitmap images created "in silicio" with defined complexity, i.e. predetermined fractal dimension of the surface. Nine groups of 20 images each, with increasing fractal dimension were created. The original images were compressed applying two formats of the JPEG2000 standard: a) JP2 (Luralwave plugin of Irfanview) and b) J2K (Convert Image - Softinterface), and then decompressed. In bitmap converted 8-bit-grayscale images we calculated the Haralick features of the co-occurrence matrix, surface fractal dimensions and the energy of different spatial frequency ranges after Fast Fourier transformation (FFT). We compared the changes of the texture variables after compression with a quality ranging between 40% and 100%.

Results

With decreasing quality of the compression, texture features revealed more intensive alterations. Only the lossless JP2 and the J2K compressions did not change its variables. With lossless methods compression factors ranged from 3.91 to 8.54, and were dependent on the complexity of the image. In general, JP2 caused less distortion than J2K, but the changes due to compression depended both on the texture feature and on the complexity of the image. Variables derived from FFT images were relatively robust against compression. The energy of high spatial frequencies was more sensible to compression than that of low frequencies.

Conclusion

Texture descriptors are in general sensible to image compression. Lossless compression is preferable for image analysis. The development of new texture features resistant (invariant) to compression is necessary.

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