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Color contrast enhancement method using steerable pyramid transform. (English)

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Summary: A new method of contrast enhancement based on steerable pyramid transform is presented in this work. The use of steerable filters is motivated by the fact that the images are to be observed by human and therefore it would be better to incorporate some knowledge on the Human Visual System in the design of the image processing tool. Here, the frequency and directional selectivity of the HVS is modeled by the steerable filters. The contrast is amplified using a selective nonlinear function which simulates the nonlinearity response of the HVS to the luminance stimuli. So the basic idea is to enhance the luminance signal irrespective of the two chrominance components using a multidirectional and multi-scale decorrelation color transform. Initially the *rgb* (red, green and blue) color image is converted to lab (luminance and chrominance) color image. Only the luminance component is transformed by the steerable pyramid transform, so that the luminance component is independently decomposed into different scale and orientation sub-bands. The contrast in each sub-band is enhanced using a nonlinear mapping function. Finally the *rgb* color image is obtained from the enhanced luminance component along with the original chrominance components. The performance of the proposed method is objectively evaluated using spectrum energy analysis and a visibility map based on a perceptual filtering model. The obtained results confirm the efficiency of the method in enhancing subtle details without affecting color balance and without the usual noise amplification and edge ringing effect.

MSC:

94A08 Image processing (compression, reconstruction, etc.) in information and communication theory

Keywords:

angular energy spectrum; contrast enhancement image and just-noticeable contrast; multiscale; multi-orientation; pyramid representation; radial energy spectrum; steerable filters; visibility map

Software:

Steerable pyramid

Full Text: [DOI](#)

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