A Gradient Orientation Based Efficient Linear Interpolation Method

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Abstract : This paper proposes a low-complexity image interpolation method. Image interpolation is used to convert a low dimension video/image to high dimension video/image. The objective of a good interpolation method is to upscale an image in such a way that it provides better edge preservation at the cost of very low complexity so that real-time processing of video frames can be made possible. However, low complexity methods tend to provide real-time interpolation at the cost of blurring, jagging and other artifacts due to errors in slope calculation. Non-linear methods, on the other hand, provide better edge preservation, but at the cost of high complexity and hence they can be considered very far from having real-time interpolation. The proposed method is a linear method that uses gradient orientation for slope calculation, unlike conventional linear methods that uses the contrast of nearby pixels. Prewitt edge detection is applied to separate uniform regions and edges. Simple line averaging is applied to unknown uniform regions, whereas unknown edge pixels are interpolated after calculation of slopes using gradient orientations of neighboring known edge pixels. As a post-processing step, bilateral filter is applied to interpolated edge regions in order to enhance the interpolated edges.

Keywords : edge detection, gradient orientation, image upscaling, linear interpolation, slope tracing

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