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APPLICATION OF A BIVARIATE RATIONAL INTERPOLATION IN IMAGE ZOOMING

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Abstract. *This paper presents a new method for image zooming. The new method is different from the traditional polynomial interpolation technique. A bivariate rational interpolation is used in the new method. Using the bivariate rational interpolation is more effective than the polynomial interpolation for image zooming, especially in processing the borders of the source image. The bivariate rational interpolation function has a simple and explicit expression, thus facilitating application of image zooming. Looking upon image data as interpolation data, an interpolation surface is constructed. According to the need of zooming, resampling the gray value on the interpolation surface with a zooming scale, the image zooming can be achieved. The advantage of the new method is the simplicity as well as the high performance. Experimentations show that the new method is able to maintain the borders of source images clearly. Furthermore, the algorithm is efficient in computation for image zooming.*
Keywords: Image zooming, Bivariate interpolation, Rational spline

1. **Introduction.** Producing digital images with good contrast and detail is a strong requirement in several areas like vision, remote sensing, biomedical image analysis, and fault detection [1-3]. Producing visually natural images or transforming the image such as to enhance the visual information within, is a primary requirement for almost all vision and image processing tasks. Methods that implement such transformations are called image enhancement techniques. Image zooming is the task of applying certain transformations to an input image such as to obtain a visually more pleasant, more detailed, or less noisy output image. The task of image zooming is a difficult one considering the fact that there is no general unifying theory of image enhancement [4]. Furthermore, many image zooming techniques are not satisfactory at present.

Image interpolation is a general research method for image zooming. Many image interpolation techniques of different tradeoffs between computational complexity and reproduction quality were developed. Popular methods, as commonly used in image/video software and hardware products, are nearest-neighbor interpolation, bilinear interpolation [5], cubic convolution interpolation [6] and cubicspline interpolation [7]. Those methods are based on a simple polynomial model, and work as low-pass filter which restrained the high-Frequency components of the digital image. The main advantage of these methods is their relatively low complexity. When the magnification is higher, their common drawback is the inability to adapt to varying pixel structures in a scene. As a result, they are all susceptible to defect such as fuzzy, zigzag stripes or block in the edge region. The edge information are lost. Because the image can be effected by the light, the impact of natural background and the characteristics of its own texture, so the relation between image's adjacent pixels is not linear.