

A NOVEL IMAGE SCALING ALGORITHM BASED ON AREA-PIXEL MODEL

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ABSTRACT. *In this paper, a novel image scaling algorithm based on area-pixel model is proposed. We use the adaptive area-pixel model and the local characteristics in the source image to estimate the luminosity of each target pixel. Compared with previous techniques, our method can preserve edge characteristics efficiently and perform better in terms of both quantitative evaluation and visual quality. Since the proposed method requires low computational complexity, it can be applied to many real-time applications.*

Keywords: Image scaling, Interpolation, Area-pixel model

1. **Introduction.** Scaling is an important issue in image processing [1-13]. It has been used in many applications such as HDTV, copy-print machines and medical imaging. For instance, when the resolution of an image generated by a host PC is different from the screen resolution of a Liquid Crystal Display (LCD), an image-scaling process is necessary.

Many scaling algorithms have been proposed in the past few years [2-8]. The most widely used and simplest scaling method is the *nearest neighbor* [2] technique, which takes the value of the nearest pixel in source image as the value of a new pixel in the scaled image. It does not change the information of the pixel's value in the image, but we may find some serious blocking effects in the scaled-up image. Another widely used technique is *bilinear* [3]. It determines the value of a target pixel based on a weighted average of the four neighboring pixels in the source image. If we use the *bilinear* method to scale up an image, we might find some serious blur effects. To solve these problems, many new methods, such as the neural-network-based method [6], the Markov random field model-based method [7] and the 2-D cubic method [8], have been proposed. Although the new scaling methods obtain better results than traditional scaling methods, they often require extensive computations and large memory space. In 2003, a new method, named the *winscale* [4], was proposed. It uses an area-pixel model instead of the common point-pixel model and takes a maximum of four pixels of the original image to calculate one pixel of a scaled image. *Winscale* has advantages such as low computational complexity, no serious blur effects and changeable smoothness, but it is still not good enough for edge preservation. Furthermore, *winscale* obtains the same results as the *nearest neighbor* when the magnification factor is an integer.

By combining the basic concepts from *winscale* [4,5] and the edge-preservation technique [9], we present a novel low-complexity scaling method. The proposed algorithm uses the