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A NOVEL ADAPTIVE INTERPOLATION ALGORITHM FOR IMAGE RESIZING

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Abstract. *In this paper, an adaptive interpolation algorithm is presented based on the Newton Polynomial to improve the limitation of the traditional algorithm for image resizing. The second-order difference of adjacent pixels gray values shows the relativity among the pixels. Accordingly, the adaptive function for image interpolation is deduced according to both this relativity and the classical Newton polynomial. Then the efficiency of our method is compared with that of the traditional algorithm for image resizing in Matlab. Furthermore, the implementation circuit architecture is devised by three stage parallelling pipelines for the adaptive image resizing algorithm and is verified in FPGA (field programmable gate array). The experimental results show that our proposed algorithm excels the bicubic interpolation in visual effect, and has a lower complexity. Therefore, the algorithm adapts to real-time image resizing.*

Keywords: Image resizing, Adaptive algorithm, Newton interpolation, Paralleling pipeline, Real-time image processing

1. **Introduction.** Image resizing is an essential aspect in digital image processing. It is widely applied in numerous fields [1-3] such as medical image processing, military applications and consumer electronics. For instance, we have to enlarge images in HDTV or medical image display, or a scale-down image will fit the minisize LCD panel in portable instruments. The efficiency of any image resizing algorithm is determined by two main factors: the quality of the obtained image and the computational complexity [2]. In order to resize a digital image, the discrete two dimensional image signals are fitted to a continuous curved surface. Then any scaling object image can be acquired by resampling the surface. A popular fitting technique is to convolute the discrete signals with a kernel function. From sampling theory, it is well known that the sin-function ($\sin x/x$) is an ideal interpolation kernel [4]. However, as pointed out by Butzer, the slow decay of the function $\sin(x\text{-}k)$ when k tends to requires the calculation of too many terms to obtain a good approximation. Therefore, the sin function itself is not very suitable for fast computation. The simplest technique is the nearest neighbor (zero order) interpolation. However, the