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A NEW METHOD OF GETTING HIGH ACCURACY AND EFFICIENCY ROTARY IMAGES

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Abstract. one-pass rotation is analyzed and its rotary matrix is decomposed in this paper, which yields three-pass rotation. Three-pass rotation avoids scales but it costs too many total memories and errors are increased. The method of three-pass rotation is optimized in this paper. It can overcome the shortages produced in three-pass rotation. The interpolation based on conicoid fitting is presented in this paper. Compared with many other interpolations, the time it costs is close to the bilinear costs but errors are decreased when it is used in the processing of rotation. If the optimized three-pass rotation and conicoid fitting interpolation are used in the operating of rotation, the high accuracy and efficiency results can be got.

Keywords. Image; Rotation; Interpolation; Optimized method; Conicoid.

1 Introduction

The image is often rotated while it is being processed. The rotation of image belongs to the transformation of geometry. The algorithm of image rotation is one of the basic algorithms of digital image processing. There are many applications that image rotation must be performed with high accuracy and efficiency and utmost fidelity to the original data. Such requirements are common in input of image scanning, bit-map of image and pattern recognition. The basic problem is interpolation (see Fig 1). Let's call the original image $s(x, y)$ and the rotated result $f(x, y)$. The pixel value to be placed in the receiving raster position (x_2, y_2) in $f(x, y)$ is to be fetched from the original image $s(x, y)$ in a point (x_1, y_1) that is not a raster point. Hence, to obtain $f(x_2, y_2)$ interpolation in $s(x, y)$ must be performed.

Many methods of interpolation are researched by some authors [1-6]. Bilinear interpolation and bicubic interpolation are often used. For many reasons, bilinear interpolation is most frequently used.

The method based on a decomposition of one-pass matrix has been discovered by some authors [7-9]. One-pass rotation is decomposed in three steps. First, the original image (see Fig 2a) is skewed along the horizontal direction by displacing each row. Second, the result is skewed along the vertical direction. Finally, an additional skewing in the horizontal direction