International Journal of Innovative
Computing, Information and Control
Volume 4, Number 9, September 2008
 ISSN 1349-4198
pp. 2405–2417

SMOOTH SHAPE INTERPOLATION FOR 2D POLYGONS

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Received July 2007; revised December 2007

Abstract. *In 2D morphing, both source and target shapes can be triangulated into compatible polygons to establish correspondence. Once the correspondence between a source and a target 2D shape is established, the linear vertex interpolation is usually used for generating in-between shapes. However, this naive scheme usually generates unnatural interpolated results. In this paper, we present a fast and easy-to-implement 2D shape interpolation scheme to generate visually pleasing morphs between 2D polygons. Each triangle in a compatible triangulation is represented by a stick structure. The intermediate shape of a triangle is interpolated using this stick structure. All of these intermediate triangles are then assembled together according to a predetermined order. Several examples of aesthetically pleasing morphs are demonstrated using the proposed method. All of these morph sequences can be generated in real time.*
Keywords: 2D Shape Morphing, Correspondence, Triangulation, Vertex interpolation

1. **Introduction.** Morphing, also called metamorphosis or shape interpolation, is a technique that blends two shapes smoothly and reasonably. Its brilliant visual effects have appeared in wide applications such as movies, games, cartoons, music videos, and many medical applications that require smooth blending between the shapes in different key frames to produce smooth 2D animation. Usually, aesthetic and effective morphing should efficiently interpolate shapes as rigidly as possible and avoid superfluous global or local deformations. In general, 2D morphing includes two major categories: image morphing and polygon morphing. The image morphing transforms an image to the desired image [1-3]. In contrast, the polygon morphing deforms the shape to the other desired shape. In this paper, we focus on morphs between two 2D polygons. Numerous aspects of 2D polygon morphing techniques have been investigated [4-13].

Generally speaking, morphing consists of two steps: correspondence and interpolation. The correspondence step establishes corresponding matching vertices or faces between the source and target shapes. This step usually requires manual intervention to specify correspondence. The interpolation step aims to find a smooth transition from a source shape to a target shape. Figure 1 gives a morph example of a dancing man. The morph sequence in the first row is generated by linearly interpolating the corresponding vertex between the source and target shapes. We can see that the dancing man's left hand shortens along this morph sequence. The morph sequence in the second row is generated using our method. It looks smoother and maintains a normal human shape. Therefore, a naïve vertex interpolation method can not resolve the morphing problem. Sederberg et al.