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Citation: Liu, Zhiguang, Leung, Howard and Shum, Hubert P. H. (2016) An Interactive Human Morphing System with Self-occlusion Enhancement. In: MIG 2016 - International Conference on Motion in Games, 10th - 12th October 2016, San Francisco, California.

URL: http://dx.doi.org/10.1145/2994258.2994286 <http://dx.doi.org/10.1145/2994258.2994286>

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An Interactive Human Morphing System with Self-occlusion Enhancement

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Figure 1: *Transforming a man with self-occlusion into one wolf beast*

CR Categories: I.3.5 [Computer Graphics]: Computational Geometry and Object Modeling—Geometric algorithms, languages, and systems

Keywords: compatible triangulation, 2D morphing

1 Introduction

Planar shape morphing methods offer solutions to blend two shapes with different silhouettes. A naive method to solve the shape morphing problem is to linearly interpolate the coordinates of each corresponding vertex pair between the source and the target polygons. However, simple linear interpolation sometimes creates intermediate polygons that contain self-intersection, resulting in geometrically incorrect transformations.

Computing compatible triangulations has successfully created smooth transformations for two different shapes. Such a process calculates the one-to-one mapping between the source and target polygons. Previous methods for building compatible triangulation usually map the source and target polygons onto a convex domain, or employ the divide-and-conquer algorithm to keep partitioning them until each sub-polygon becomes a triangle.

We observed that the existing compatible triangulation approaches cannot well handle shapes with occlusion. Triangulation for shape with occlusion cannot distinguish overlapping body parts such that the transformations will generate artifacts. In this paper, we propose an efficient method for computing compatible triangulations of two simple polygons with occlusion enabled.

2 Our Method

Our inputs are the RGB image of the user, together with its skeleton joints, and the target shape with texture. We want to build the compatible triangulation between user shape with self-occlusion and the target shape such that we can generate sensible transformations. (1) We capture a calibration shape of the user which gives us the full body texture of the user without self-occlusion. (2) We build the compatible triangulation between the calibration and target shapes, which bridges the shape with self-occlusion and the target shape. (3) We use the joints estimated from Kinect as constraint points to deform the mesh of calibration shape into the user pose with occlusion, which builds the compatible triangulation between the user with occlusion and the target shape.

To do so, we follow [Liu et al. 2015] to compute compatible triangulation between the calibration shape and target shapes. We deform the mesh of calibration shape using rigid mesh deformation method [Igarashi et al. 2005]. We apply the posture reconstruction method [Liu et al. 2016] to enhance the joints estimate from Kinect as data from Kinect are noisy and unreliable. Finally, we use the rigid shape interpolation method [Alexa et al. 2000] to transform the shape of the user with occlusion into the target shape.

As shown in Fig. 1, we blend the human with self-occlusion and the wolf beast. Compared with the transformations that do not consider body parts overlap, the results in Fig. 1 make more sense as we transform the human's limbs into the corresponding parts of the wolf beast.

Acknowledgments

The work described in this paper was partially supported by a grant from City University of Hong Kong (Project No. 7004548) and the Engineering and Physical Sciences Research Council (EPSRC) (Ref: EP/M002632/1).

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MiG '16 October 10-12, 2016, Burlingame, CA, USA

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ACM ISBN 978-1-4503-4592-7/16/10.

DOI: http://dx.doi.org/10.1145/2994258.2994286