

Image deformer on iPad

Dept. of Maths. Yamaguchi Univ. / JST PRESTO

Shizuo KAJI (skaji@yamaguchi-u.ac.jp)

Abstract

We developed grid (2D-mesh) based image deformers which work on iOS devices. A loaded image or real-time input from the camera is converted to a texture placed on a triangulated grid, and the grid is deformed in real-time according to user's touch gestures. A few different deformation algorithms are implemented. The source codes are available at my github under MIT license.

Deformation algorithms

- I. Energy based [1,2]
User's finger locations on the screen are set as the constrained points. The positions of other grid points are computed by minimising the local distortion of the mesh. There are three variations of the measure of distortion: one based on the Frobenius norm, a rotation invariant version, and a similarity-transformation invariant version.
- II. Anti-commutative-dual-complex-number (DCN) based [3]
DCN is an extension of complex numbers which is capable of representing rigid transformation in 2D. The user specifies control points and their associated 2D rigid transformations. A blended transformation for each grid point is computed based on the specified transformations and weights defined by the distance, and then is applied to the point. Computation can be done on vertex shaders. (our implementation uses CPU)
- III. Moving Least Squares based [4]
The rigid (or similarity) transformation which aligns the control points best in the sense of moving least squares is computed and applied to each grid point.

Example



<https://github.com/shizuo-kaji/>

3D versions for Autodesk Maya are also available

References

- [1] T. Igarashi, T. Moscovich, J. F. Hughes, As-Rigid-As-Possible Shape Manipulation, Proc. SIGGRAPH 2005, pp. 1134--1141
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- [3] G. Matsuda, S. Kaji, and H. Ochiai, Anti-commutative Dual Complex Numbers and 2D Rigid Transformation, Mathematical Progress in Expressive Image Synthesis I, pp. 131--138, Springer-Japan, 2014
- [4] S. Schaefer, T. McPhail, and J. Warren, Image deformation using moving least squares, Proc. SIGGRAPH 2006, pp. 533-540