Parameterization of Triangulated Surface Meshes based on Constraints of Distortion Energy Optimization

Junxiao Xue, Qingbin Li, Chengming Liu, Mingliang Xu

PII: S1045-926X(17)30287-2
DOI: 10.1016/j.jvlc.2018.01.002
Reference: YJVLC 826

To appear in: *Journal of Visual Languages and Computing*

Received date: 20 December 2017
Accepted date: 19 January 2018

Please cite this article as: Junxiao Xue, Qingbin Li, Chengming Liu, Mingliang Xu, Parameterization of Triangulated Surface Meshes based on Constraints of Distortion Energy Optimization, *Journal of Visual Languages and Computing* (2018), doi: 10.1016/j.jvlc.2018.01.002

Parameterization of Triangulated Surface Meshes based on Constraints of Distortion Energy Optimization

Junxiao Xue[1], Qingbin Li[2], Chengming Liu[1], Mingliang Xu[3]

1 School of Software, Zhengzhou University,Zhengzhou, 450000, China
2 Department of Mathematics and Physics, Zhengzhou Institute of Aeronautical Industry Management, Zhengzhou, 450046, China
3 School of Information Engineering, Zhengzhou University, Zhengzhou, 450000, China

Abstract

Parameterization of triangulated surface meshes is a crucial problem in computer graphics, computer aided geometric design and digital geometric processing. This paper addresses the problem of planar parameterization, i.e., mapping a given triangulated surface onto a planar domain. We construct an optimized algorithm for parameterization of genus-zero meshes and aim to minimize the distortion of the parameterization. An energy functional is proposed in the paper, that quantities angle and area distortions simultaneously, while the relative importance between angle and area preservation can be controlled by the user through a parameter. The method is based on an iterative procedure that incrementally flattens mesh by growing region to obtain a parameterization result with free boundary. The result is then converted to a parameterization with regular boundary by conformal mapping. Application of the method to texture mapping is presented. Experiments show that the proposed method can obtain better results than some common parameterization methods.

Keywords: Triangular Mesh, Parameterization, Conformal Mapping

1. Introduction

With the development of computer technology and 3D acquisition technique, 3D geometric data has become the fourth most important multimedia data type after the voice, image, and video. 3D triangular mesh is a simple, flexible technique and widely supported by graphics hardware. Therefore, a