

# An automated method for creating cages for high definition 3D meshes

Ákos Tóth<sup>a</sup>, Roland Kunkli<sup>a</sup>

<sup>a</sup>University of Debrecen, Faculty of Informatics, Debrecen, Hungary  
toth.akos@inf.unideb.hu, kunkli.roland@inf.unideb.hu

## Abstract

These days, thanks to the rapid evolution of modern computer graphics tools, we often need to use detailed three-dimensional models to achieve the desired quality of the rendered scene.

In order to create the possibility of the direct manipulation of these models, a lot of deformation techniques appeared in the last years (e.g. Mean Value Coordinates, Harmonic Coordinates or Green Coordinates) and solved this problem after a short pre-computation phase. These methods use a simplified, coarser triangle mesh (so-called cage) for the manipulation of the models. The only condition that needs to be satisfied by the deformed model is that it should be inside the control cage, so these techniques define a relationship between the cage and its interior with the help of barycentric coordinates. Thereafter, the deformation of the internal object can be achieved by the movement of the cage vertices. Currently, these coarse cages are often constructed by the users manually, which is a tedious and time-consuming task. Recently, the existing methods usually solve the problem of cage generation with complex optimization techniques. Due to lack of this optimization the resulted cages are not detailed sufficiently.

In this talk we suggest an easily and obviously calculated solution, which is based on barycentric coordinates, to generate cages automatically for 3D triangulated meshes. In the case when the desired cage may contain approximately the same number of vertices than the input model itself, the method can create a cage which contains all of the vertices of the model, and further calculations are not required. Although, we can generate a less detailed output by using a mesh simplification method. In this case, the algorithm may induce intersections between the cage and the input model, which can be also corrected automatically for appropriate results.

*Keywords:* barycentric coordinates, cage-based deformation, cage generation

*MSC:* 68U05