2.5D Cartoon Models
Technology #14391

Applications

The Inventors have developed a method to bring cartoon objects and characters into the third dimension, by giving them the ability to rotate and be viewed from any angle. This has wide ranging applications, both in aiding animation and in enabling cartoon objects to be placed in an interactive 3D environment in which the user controls the viewpoint.

Problem Addressed

Previously, cartoon rotation has been achieved by constructing a 3D model of the cartoon and rendering it in a non-photorealistic way so as to resemble a cartoon. However, generating a 3D model is time-consuming, and many stylistic elements of 2D drawings cannot be adequately reproduced in a 3D model. The inventors have developed a method to use 2D vector art drawings of a cartoon from different angles to generate a novel structure, the 2.5D cartoon model, which can be used to simulate 3D rotations and generate plausible renderings of the cartoon from any view. 2.5D cartoon models are easier to create and retain the 2D nature of hand-drawn vector art, supporting a wide range of stylizations that need not correspond to any real 3D shape.

Technology

This method takes as input 2D vector art drawings of a cartoon from different angles that are referred to as “key views.” The goal of 2.5D interpolation is to generate an interpolated view that resembles a rotation to an intermediate viewpoint. To interpolate across the key views for each stroke, it is necessary to determine the appearance of a stroke in a novel view. For this, the stroke’s shape, position, and Z-ordering must be determined. The core realization of the Inventors’ approach is that these challenges can be separated, and tackled with different tools.

A stroke’s shape can be approximated well by simple 2D interpolation, while its positions and Z-ordering are essentially 3D properties and can be easily modeled by the motion of a single 3D point associated with its 2D vector stroke. In general, this structure can be conceptualized as a collection of billboards positioned in 3D space, with each billboard containing a single stroke of the cartoon. To simulate a rotation between known key views, the billboards’ positions are rotated in 3D about the origin, while the vector art on the billboards is interpolated with simple 2D interpolation. The result is a 2.5D cartoon that retains the 2D, hand-drawn nature of the input vector art, while supporting full 3D rotation.

Advantages

- Cartoons retain stylistic nature of 2D hand-drawn vector art
- 2.5D models can be rotated despite having no explicit 3D polygonal mesh
- Only 3-4 key views are required to generate rotations and renderings in any orientation
- Cheaper method for 3D rendering
Categories For This Invention:

Computer Sciences & Information Technology
Computer Aided Design & Learning

Intellectual Property:

Computer method and apparatus for rotating 2D cartoons using 2.5D cartoon models
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8,791,942

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Publications:

2.5 D Cartoon Models
ACM Transactions on Graphics (TOG)
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External Links:

MIT 2.5D Cartoon Models
https://vimeo.com/11941007
Computer Graphics Group
http://graphics.csail.mit.edu/

Image Gallery: