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3D modeling

Three-dimensional graphics is an important part of the life of modern man, covering many fields of human activity. 3D models are used in the film industry (creation of special effects), in the development of video games (creation of objects of the virtual world), in medicine (creation of implants based on three-dimensional images of the patient, taking into account its functional characteristics), in design (visualization of interiors, landscapes, etc.) and many other areas.

The founder of 3D graphics is Ivan Sutherland. In the 1963 he developed the SketchPad app, which you could use to create 3D models [1]. It became the "impetus" for the development of three-dimensional modeling.

3D modeling is the process of creating a three-dimensional model of any object [2]. The process usually involves creating an object mesh and then texturing it.

A model can be created automatically, or manually by a 3D modeler.

3D model can be automatically generated on the basis of photographs, video or using a 3D scanner. This method allows you to create a highly detailed object of a good quality. However, this level of quality significantly slows down rendering and increases load on a computer.

When creating object mesh manually, designers usually use one of four general modeling methods, exactly primitive, polygonal, curve and sculptural.

Primitive modeling is the easiest way of modeling 3D models, that includes the use of geometric figure such as planes, cubes, circles, spheres, cylinders, cones and so on [3].

Polygonal modeling is more advanced method then primitive modeling. Polygon modeling involves manipulating the vertices, edges, and faces of polygons, that make up the model, in a 3D space. It is versatile and can be rendered by a computer quite rapidly. However, it is impossible to create a perfectly smooth curved surface, using the method of polygonal three-dimensional modeling.

Curve modeling is one of the best method for designer to make really curved smooth surfaces in comparison with polygonal modeling techniques, which can only approximate curved surfaces using large number of polygons.

Sculptural modeling is based on the representation of the model in the form of some substance that can push, pull, smooth, grab, pinch or otherwise manipulate as if the sculptor would work with ordinary clay or stone.

After creating an object mesh, typically the next step might be texturing the model, that implies projecting raster or procedural images on a surface of a three-dimensional object according to a UV coordinate map, where each vertex of the object with coordinates X, Y, Z corresponds to the coordinates U, V in the two-dimensional texture space, to the model that will define:

– its color (color map);
– its metallicity (metallic map);
– its reflectivity (roughness map);
– its surface texture, defined through light-play (normal map).

The totality of all maps of the object form the material that is responsible for its properties when rendering.

The prospects of 3D technology are huge. It is worth considering the fact that they are constantly improving and becoming cheaper, opening up new opportunities in various fields of human activity.

Литература

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