

Image-based rendering:

In computer graphics, the final image is usually built by a geometry-based system through a perspective view. The realism of the final result is based on the lighting simulation and texture fidelity. However, when the scene is too complex or the subtle light effect in the real world is too difficult to simulate, traditional way has some limitation or the cost to simulate is too high. In this case, image-based rendering system was created to improve the realism of the 3D model and used to approximate global illumination effects as well. In Plenoptic Modeling [1], McMillan and Bishop discuss finding the disparity of each pixel in stereo pairs of cylindrical images. Gortler and Grzeszczuk [2] used a 4D function called Lumigraph. This system is made for sampling the plenoptic function by handheld camera and use these light in Lumigraph. Marc and Pat [3] propose a robust way named light field rendering to give more freedom view of image-based rendering. The main idea is to fill in regions of space free of occluders by creating a light field from a set of images corresponding to inserting each 2D slices into the 4D light field representation.

PCA:

Principal component analysis [4] is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables. The number of principal components is less than or equal to the smaller of the number of original variables or the number of observations. Dimensionality reduction using PCA enables pose changes to be visualised as manifolds in low-dimensional subspaces and provides a useful mechanism for investigating face pose [5]. Ko Nishino [6] proposed the Eigen-Texture method to create a 3D model of an object from a sequence of range images. By aligning the pixel value from images into the 3D model, it can get a nice control of the mixed reality system.

Volume rendering:

Contrary to surface rendering, volume rendering is a technique to render 3D volume data to show the interior information of the object, usually used in medicine and some fuzzy objects. There are several ways for the 3D volume data visualization. The most basic volume rendering algorithm is ray-casting which uses straight-forward numerical evaluation of the volume rendering integral [7]. 2D texture [8] and 3D texture [9] mapping were used in these places. However, because of the large data size, it still cost a lot to render the volume data directly on standard hardware in

real time. In this case, image-based rendering, as mentioned previously, is an alternative to deal with volume data. Chen [10] presented a way to render surfaces from volume data by integrating the fully volume rendered image (the keyview) and the model of the volume. Tikhonova [11] used a representation of a multi-layered image, or an explorable image to show interior structure of the object, by simulating opacity changes and recoloring of individual features. Meyer [12] came up with an image-based volume rendering with opacity light fields. He separated the process to three parts, getting ray slices and proxy surface, generating key views and interactively rendering as opacity light fields. This approach can take advantage of the different features of the hardware, leave the heavier rendering work to the good graphics cards and combine the final result in remote application.

Reference:

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