ISSN 2250-3153

3D Reconstruction from Multiple Images Using Inverse-Mapping IDVR

Raginee Tripathi, R.S. Jadon

Department of Computer Application
Madhav Institute of Technology & Science, Gwalior M.P. India

Abstract- According to the principle of direct volume rendering (DVR), visualization can be created without using the intermediate geometrical structure of images, such as mesh, grid, silhouettes etc. In-fact the direct volume rendering is a mapping process from volume data (voxels) of points. Inverse volume rendering is not required geometric parameters of cameras and images, only the optical properties of images are more important than others, such as colour, light, opacity, etc. Flexibility of interactive direct volume rendering(IDVR) is depends upon the transfer functions and function points for appropriate operation such as image stitching, blending and warping etc. before describing the inverse mapping approach to find out transfer functions and specifying the basic steps for mapping and reconstruction. This motivates the study of various transfer and mapping functions and requirements of interaction techniques for visualization system, So that the interface can produce the visual effects on various steps and processes of volume rendering.

Index Terms- direct volume rendering, 3D reconstruction, volume visualization, inverse mapping.

I. INTRODUCTION

We want to formulate the imaging process of small images so that a panoramic view of a 3D object can be view as a single image or you can say in the form of volume. Volume rendering is followed by image matting of various images in such form that they can easily formulated together for a single mat using matrix operations. This estimation we are calling inverse mapping for interactive direct volume rendering, can be performed efficiently through maximization method.

In recent years direct volume rendering has proven as a powerful tool for the visual data exploration, which is an interactive process of the field of computer vision. In this paper, we detail our efforts for inverse process of projection that make interactive DVR. In order to the exploration of the power of DVR is an analysis tool of static images representing complex 3D panorama. We present a volume rendering system based on a mapping from 2D to 3D which is inverse procedure of projection, and for stitching it requires integration of matrix.

In this paper, we propose a method of volumetric image reconstruction using the voxels (3D array) based on inverse of projection that creates a synthetic view of an object. Volumetric data is image data having details in terms of X, Y and Z co-ordinates which are related with each others.

II. RELATED WORK

A. Inverse volume rendering

In [1] Shuntaro Yamazaki et al proposed OSEM method to reconstruct object shape by a set of coarse voxels that can model the spatial occupancy inside the each voxel. They implement Expectation Maximization method that can overcome the difficulties of linear system. The EM algorithm in their estimation can be accelerated by dividing the problem into several subsets of images then the linear system is solved using one of the subsets. Once the algorithm has been converged, the linear system is solved using another subset subsequently.

B. Multi view reconstruction:

Interactive Direct Volume Rendering of Time-Varying Data is popular approach to volume visualization proposed by John Clyne et al in [2]. In [3] Seitz et al proposed voxel colouring methodology for photorealistic Scene, which can overcome cost complexity problem with the existing schemes. In [4] Eric B. Lum et al present a method for interactive non-photorealistic volume rendering using hardware accelerated rendering techniques with a PC cluster. In [5] Van Gelder et al proposed a direct volume rendering with shading via 3D textures.

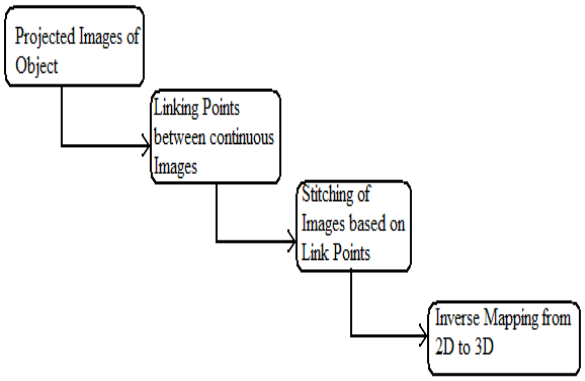
C. Fast volume rendering:

In terms of Direct Volume rendering C.R Johnson et al explained the methodology in [6] for Interactive Simulation and Visualization. In [7] Philippe Lacroute et al propose Shear-Warp Factorization method for viewing transformation. In this approach they construct a scan-line based algorithm that traverses the volume and the intermediate image. In [8] Marc Levoy et al propose an approach for surface reconstruction from volume data which is the part of fast volume rendering.

III. SYSTEM OVERVIEW

In our approach we describe a new procedure which combines the advantages of image-order and object-order algorithms; this method is based on inverse mapping of projection based on image space algorithm. Our procedure is the combination of various schemes like parallel projection, ray tracing in such way that can visualize a 3D object with in single frame work.

Many researchers have proposed methods that reduce rendering cost without affecting image quality but in our approach the image quality may be reduce due to inverse mapping and diversion of link points. This method is used opacity of the images for colouring so possibility of quality reduction is possible.



IV. IMPLEMENTATION

The process describe above is the result of the feature exploration in the form of volumetric dataset. So that boundary calculation of the 3D object can be easily made for object representation. In essence, the feature can be regarded as a segmentation note book, where features, once captured are collected in a common environment. So at the time of practice of 3D visualization first we copy the data for boundary mapping, then for link points. When we get the actual shape of the 3D object, then the inverse mapping for colour is essential for exploration of the object. Original volumetric dataset fetches from featured volume and then perform the segmentation of the images, and then migrate for the stitching in such a way that the density distribution can not change the original shape of the object. The methodology for practical aspect need following steps to follow:

A. Sampling

We suppose the sampling of data is required device and soft tools that can help to collect raw data for further processing, thus we are using high resolution camera and Microsoft SQL server for binary data storage.

B. Pre-processing and Composition

MATLAB 7.0.1.24704 and Microsoft Visual Basic .net are required tools for variables and front designing. But how the assembling process will run, this is an essential procedure. There are the lots of methods available for transferring data from one work space to other space, but co-ordination between them is essential.

C. Parallel Projection Rendering

This is a process of rendering for the related images with in one frame work so that the representation of new image can came into existence.

D. Transformation into Intermediate Images for warping and blending

Due to interactivity, the transformation process would be quite difficult and a little complex. We are utilising the image processing tools provided by MATLAB. When we discuss the whole scenario of image reconstruction, it brings the clear picture of inverse mapping DVR.

E. Surface Mapping using Ray Radiating:

In this surface recovering procedure there is a scheme which is based on the optical light phenomena. The working of surface mapping procedure is used the voxel address and the corresponding light intensity, and after transformation of the corresponding pixel visualization map onto the display device. Due to the mapping between 2D arrays and multiple 3D arrays the visualization effect can be changed, but the reconstruction is surely possible. We are continuously working on the various devices that are of different architecture.

V. CONCLUSION

We have presented a framework that enables an intuitive, feature-centric exploration of volumetric dataset. This approach is work towards the inverse of projection process that can create a complexity problem at the time of colour and opacity mapping from 2D to 3D. Inverse-Mapping IDVR method allows us to implement the methodology in optimized and low computational overhead because its data structure is required mapping function which is very flexible for wide range dataset.

REFERENCES

[1] SHUNATARO YAMAZAKI, MASAAKI AND TAKEO KANADE. ”Inverse Volume Rendering Approach to 3D Reconstruction from Multiple Images”. 7th Asian Conference of Computer Vision, pp. 409-418, 13-16 January 2006.

[2] JOHN CLYNE AND JOHN M.DENNIS. “Interactive Direct Volume Rendering of Time-Varying Data”. In Proceeding of Data Visualization, pp. 109-120, 1990.

[3] SEITZ, S.M., DYER, D.M. “Photorealistic Scene Reconstruction by Voxel colouring.” In proceeding of Computer Vision and Pattern Recognition. pp. 1067-1073, 1997.

[4] ERIC B. LUM, KWAN LIU MA. “Hardware- Accelerated Parallel Non-Photorealistic Volume Rendering”.

[5] VAN GELDER, A., HOFFMAN, U. “Direct Volume Rendering with Shading via 3D Textures”. In Proceeding of ACM Symposium on volume visualization. pp. 203-209. October 2000.

[6] CHRISTOFER R. JOHNSON, STEVEN G. PARKER, CHARLES D. HANSEN, GORDON L. KINDLMANN AND YARDEN LIVNET.” Interactive Simulation and Visualization”. IEEE Computer pp.59-65, 1999.

[7] PHILIPPE LACROUTE, MARC LEVOY.” Fast Volume Rendering Using a shear-Warp Factorization of the Viewing Transformation”. In Proceeding IEEE Symposium on parallel computing.

[8] LEVOY MARC. ”Display of Surfaces from Volume Data”. IEEE Computer Graphics & Application, pp. 29-37, May 1988.

[9] PORTER, THOMAS AND TOM DUFF. ”Compositing Digital Images”. Proceeding of SIGGRAPH 84. Computer Graphics, pp. 253-259, July 1984.

[10] WESTOVER LEE. “Footprint Evaluation for Volume Rendering”. Proceeding of SIGGRAPH 90. Computer Graphics, pp. 367-376, August 1990.

[11] M.B. AMIN, A. GRAMA AND V.SINGH. “Fast Volume Rendering using an efficient scalable parallel formulation of the Shear Warp Algorithm”. In Parallel Rendering Symposium, pp. 7-14, Atlanta GA, October 1995.

[12] R.A. DREBIN, L. CARPENTER AND P. HANRAHAN. ”Volume Rendering”. ACM Computer Graphics, pp. 65-74, August 1988.

AUTHORS

First Author – Raginee Tripathi, Department of Computer Application, Madhav Institute of Technology & Science, Gwalior, M.P., India. Email id - raginee_tripathi@rediffmail.com

Second Author – R.S. Jadon, Department of Computer Application, Madhav Institute of Technology & Science, Gwalior, M.P., India. Email id - rsj_mits@yahoo.com