International Science and Technology Journal
المجلة الدولية للعلوم والتقنية

Volume 33 العدد
Part 1 المجلد
October 2023 اكتوبر

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Reconstruction of Maya 3D Holoscopic Images

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Abstract.
3D Holoscopic imaging (also referred to as Integral Imaging) is a technique to create full colour 3D optical models that exist in space independently of the observer. The creators of 3D HI contents are always looked for new forms and ways for improving their contents and adding new sensations to the observer experience. High Definition of animations have been the latest innovation in the area of contents enrichment. The 3D HI is surly the next single greatest innovation in film making. This paper presents a developed software application to reconstruction and display of Maya 3D Holoscopic images system linked up with the 3D Camera system. The production of new developed software is static and animations (sequence of images). The resulting Maya 3D Holoscopic images are capable to offer the observers with 3D HI full parallax a wide view angle and hence offering eyes-fatigue free viewing to more than one viewer, independently of the observer's location. The command prompt line is used with the software to allow users to set up the parameter values, attributes and characteristics of the desired 3D Maya Holoscopic images scene. The adapted multiprocessor ray tracing system (Tachyon) software receives the instructions and the parameter values from the command line, and imports the computer-generated 2D models that are intended to be rendered as 3D Holoscopic images. The Holoscopic imaging process that is implemented with the simulated camera is based on particular algorithms such multiprocessor ray tracing introduced for this purpose calibration of camera transforms matrixes.

Keywords: computer graphics, 3D Holoscopic images processing & visualization, software application, multiprocessor ray tracing system, Maya 3D package.

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إعادة تكوين محتوي الصور المتكاملة ثلاثية الأبعاد باستخدام برمجيات رسومات الحاسب الآلي

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الملخص:

تقنية الصور المتكاملة ثلاثية الأبعاد، تعتمد على تكوين مجسم بصري ملون حقيقي يوفر المشاهدة للمنظر الكاملة من جميع الزوايا بدون الحاجة إلى أدوات رؤية كالنظارات.

تكوين محتوي جديد ثلاثي الأبعاد يعتبر شيء جديد، حيث إن هذه الطريقة تقدم محتوي من برمجيات الرسومات الحاسب الآلي. لكي يتم الربط بين هذه الطريقة وخوارزمية تتبع الشعاع للمعالجات المتعددة فقد تم تطوير برنامج حاسب ألي كمترجم أو مفسر وأيضا تطوير صيغة جديدة لمحتوي ثلاثي الأبعاد يعمل كواقع معزز وعدسات اسطوانية صغيرة.

الكلمات المفتاحية:

خوارزمية تتبع الشعاع للمعالجات المتعددة، تكوين محتويات الصور المتكاملة ثلاثية الأبعاد، الرسومات الحاسوبية، العدسات الأسطوانية المصغرة، وسائط العرض ثلاثية الأبعاد.

1. Introduction

The proposed algorithm introduces a unique approach by utilizing the former researches [1-9] to deal with the generation of Maya 3D Holoscoic Images an animation.The new developed method is included a Maya 3D computer graphics software and multiprocessor ray tracing system is used to create an animation. As a result, the new method is accomplished by incorporate programming codes in C, Object-Oriented in C++, Java and MatLap to adapt Parallel ray tracing system "Tachyon", [10-12].The 3D camera is used as cylindrical lenses. The new technique is mainly reconstruction of new 3D Holoscopic Image.

2. Advanced Holoscopic Images System

Capturing 3D Holoscopic images is possible electronically using a

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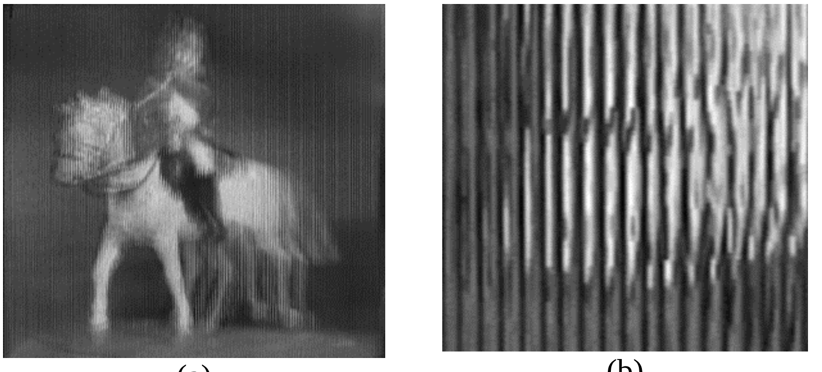
commercially existing CCD array [13-24]. This procedure of capturing is required a high resolution CCD along with specialised optical components to record the micro-images fields produced by precision micro-optics. The object or the scene records using a CCD positioned behind the recording micro-lens array via a rectangular aperture. The aperture really affects the characteristics of the micro-images recorded. In the meantime each micro-image is an image of the object viewed via the aperture independently, its shape and size is determined by that aperture. If the field of a sub-image of the scene is entirely filled by the image, it is called a *fully- filled*, otherwise it is called *under-filled* or *over-filled*.

The system is recorded live images in a regular block pixel pattern. The planar intensity distribution representing an Holoscopic images are comprised of 2D array of $M \times M$ sub-images due to the structure of the micro-lens array used in the capturing and replaying. Not the same configuration patterns can be used during the designing and manufacturing of micro-lens arrays as illustrated in Fig. 1. The *packing density* or *fill factor* is extremely crucial design criterion. The hexagonal arrangement of element micro-lenses have a higher capacity of the lens grid, and the hexagonal element shape and size leads to 100% packing density without dead space [25-34]. These properties of the hexagonal micro-lens array make it a very high potential choice for OHI.

The out coming 3D images are termed Omni direction Holoscopic Images (OHI) and have parallax in all directions. The rectangular aperture at the front of the camera and the regular structure of the hexagonal micro-lenses array are used in the hexagonal grid (recording micro-lens array) give rise to a regular 'brick structure' in the intensity distribution as shown in Fig.1 and 2. Unidirectional Holoscopic Image (UHI) obtains using a special case of the Holoscopic 3D image system where 1D cylindrical sheet micro-lens array is used for capturing and replaying instead of a 2D array of micro-lenses. A sample of a cylindrical-lens array is shown in Fig. 1 and 2. The out coming image contains only parallax in the horizontal direction. Fig. 1(a) illustrations an electronic a captured unidirectional 3D Holoscopic image and Fig. 1(b) illustrations an enlargement portion of the image.



(a) (b)

Fig. 1. 3D electronically is generated unidirectional Holoscopic image (a) Full (b) Enlargementof 3D HI [8

The *M* vertically running bands present in the planar intensity distribution captures using 3D Holoscopic camera are due to the regular structure of the 1D cylindrical micro-lens array used in the capture process.

Replaying of the 3D Holoscopic images is accomplished by placing a micro-lens array on the top of the recoded planar intensity distributions. The micro-lenses array have to match precisely the structure of the planar intensity distribution.

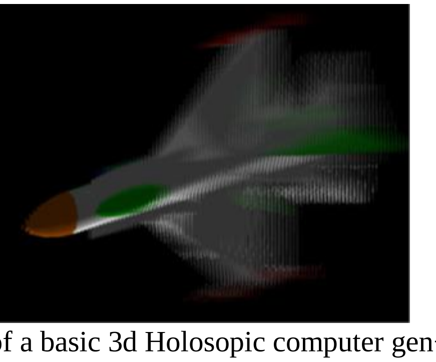


Fig. 2. Sample of a basic 3d Holosopic computer gen¬erated image portion of an animation sequence.[1]

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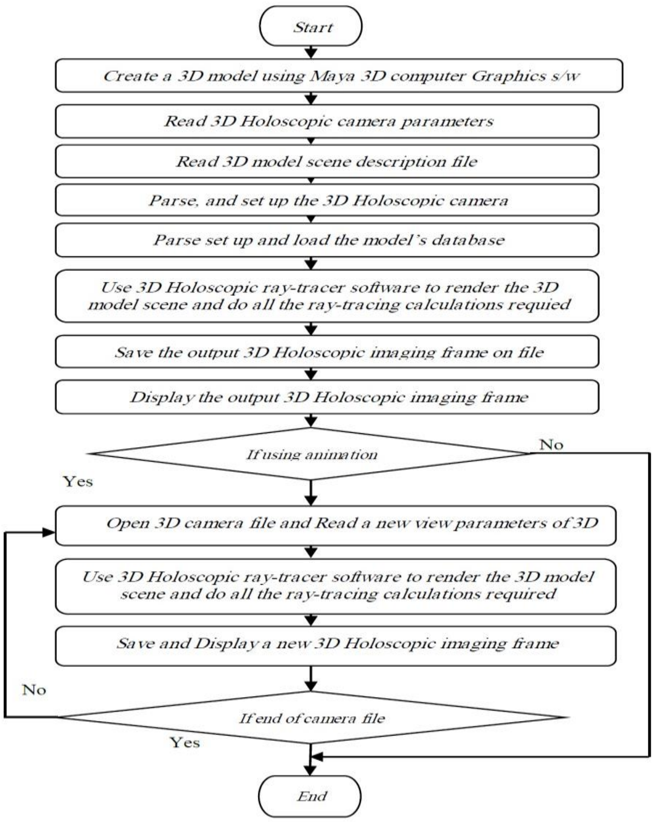
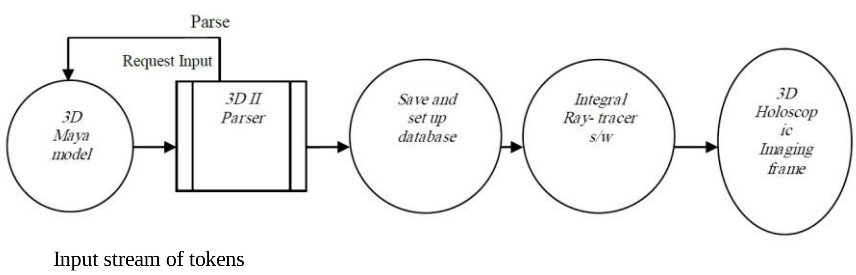


Fig. 3: Flow chart of Maya 3D integral image animations plug-in parser. software.



.Fig. 4: Overview of Maya 3D Holoscopic Imaging Animation Parser

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3D computer graphical software

The new technique is advanced the current existing technologies for generating, capturing and manipulating of 3D contents and to create new 3D HI contents for matting named Maya 3D Holoscopic image, that effecting the new technique has been investigated the generation of a novel true 3D video technology, based on mixed 3D Holoscopic video content capture and associated manipulation, and display technologies. The outcomes of the proposed method is surly have extremely and highly impacts to users, producers, content creators, and film-makers. In order to develop an holoscopic plug-in interface software that is capable of produce sequence of 3D holoscopic image frames, a 3D model is to be designed using commercial available computer graphics tools such 3D Maya software packages, as input to the 3D computer generated holoscopic imaging software. That has been adapted to generate 3D holoscopic images parse in order to parse stream of tokens as shown in fig. 3 and 4. As a result, a sequence of 3D holoscopic imaging frames is produced. The file formats "*.ma" of the commercial software packages that can be plugged in Fig. 5.

```
static errcode GetObject(FILE * dfile, SceneHandle scene) {
char objtype[180];

 fscanf(dfile, "%s", objtype);
if (!stringcmp(objtype, " persp_depth ")) {
return PARSEEOF; }
if (!stringcmp(objtype, " createNode transform ")) {
return GetTexDef(dfile);
 }
if (!stringcmp(objtype, " createNode camera ")) {
return GetTexAlias(dfile);
 }
if (!stringcmp(objtype, " setAttr ")) {
return GetBackGnd(dfile, scene);
 }
.............
```

Fig. 5: Piece of code of C, C++ and Java languages to parsea new generated Maya 3D Holoscopic image file data

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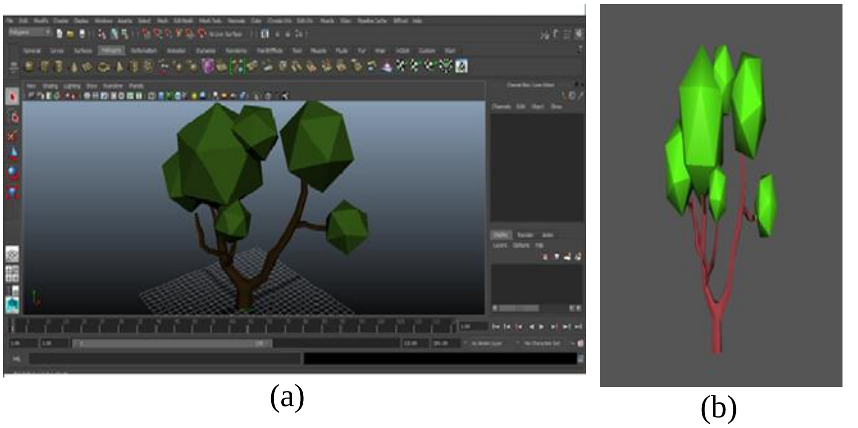
The Maya software is a specified file format that describes 3D models, scenes, and environments. 3D Maya is computer graphic software that is used in order to develop a 3D games, 3D applications, animation movies, 3DTV series, and graphical effects, this package will be created complicate and riches 3D models, that will support to design Ultra 3D effects which create a realistic view at the user end.

3. Experiments and Results

In this paper 3D Holoscopic Plug in software is developed in order to interface between 3D computer graphics models and 3D Holoscopic ray tracing method, commercial existing 3D computer graphical software packages such as Maya packages that allow the designer to design 3D models are considered. The Holoscopic ray tracer software is modified in order to create a new3DHoloscopicImageparser that can read, parse and handle each token of the 3D scene description file. If there are values that have to be read they are saved by a routine. The sequences of frames of scene tested are generated using the proposed 3D Holoscopic image ray tracing algorithm (e.g., tree) is illustrated in Fig. 6 and 7.



(a) (b)

Fig. 6: 3D tree model is created by Maya computer graphics software package.

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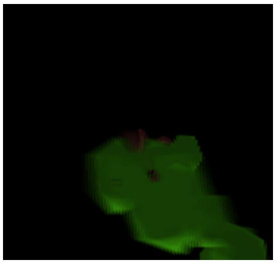
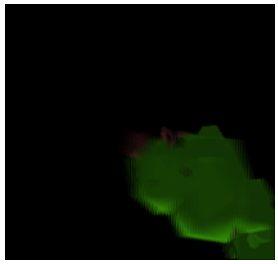
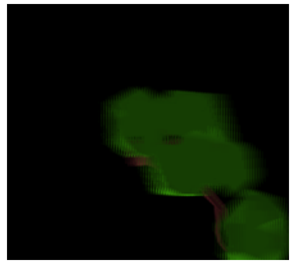
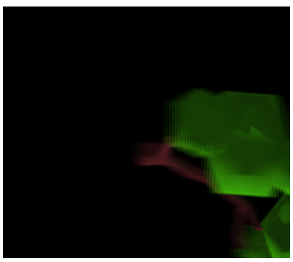
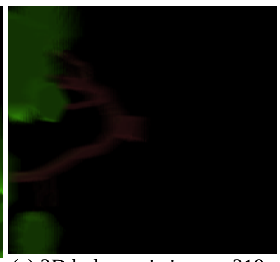

(a) 3D holoscopic image .001


(b) 3D holoscopic image .099

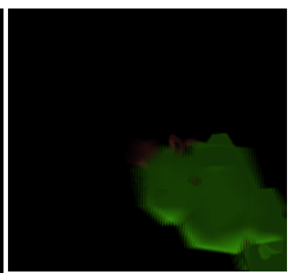

(c) 3D holoscopic image .198

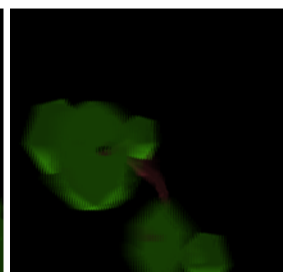

(d) 3D holoscopic image .249

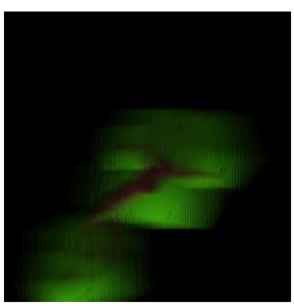

(e) 3D holoscopic image .319


(f)3D holoscopic image .409


(g) 3D holoscopic image .539


(h) 3D holoscopic image .601


(i) 3D holoscopic image .698


(j)3D holoscopic image .719

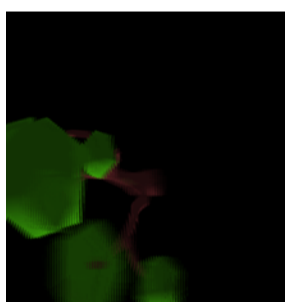

(k) 3D holoscopic image .799

Fig. 7(a)-(k): computer generated 3D holoscopic images animation.

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The resolution image of the still frame is set-up to 1024 × 768 pixels each frame, the number of pixels behind perlens = 9, and the total number of cylindrical lenses on one single 3D integral image frame is 64 cylindrical lens. The fig. 6 illustrations view space windows of Maya software (Front, Below, Up sky direction and3D camera angles). The 3D creator can be interacted with 3D models via orthographic projection and view 3D model in the 3D space, that displays the currently designed 3d model in a 3D perspective area.

4. Conclusion

This paper presents a novel technique that can produce An offline 3D Holoscopic computer animation films, using the Holoscopic ray tracing algorithm. A 3DHIP is developed to allow the Holoscopic Image ray tracer to be able to read and load 3D models stream of tokenises from commercial existing 3D computer graphics software such Maya *.ma. Sequences of 3D Holoscopic Image frames of tested scene or models have been produced such as tree scene presented. Despite a basic and simple 3D model is used, this still show-cases to demonstrate the methodologies behind 3D Holoscopic Image and that is displayed successfully.

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