2D to 3D Conversion

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***Abstract*-- The paper discusses the process of creating 3D images from 2D images with the use of MATLAB. 3D imaging has gained vast importance in the field of technology. Such conversion is especially useful for creating 3D Television signals, Security systems, face recognition etc. The first step of 2D to 3D image conversion is edge detection which helps in identifying the outline of objects to enable 3D generation. Segmentation based on edge detection will identify regions for conversion. A novel approach to 2D to 3D image conversion involves taking several images of the same object & combining it into a single three-dimensional image. The top, front and side views of an image are sufficient to plot a complete symmetric object in three dimensions. However, for an asymmetric object, we require 6 views of top, bottom, front, back and two sides.**

***Index Terms*--3D matrix, Luminance, Edge detection**

I. INTRODUCTION

WE live in a world where all objects have three dimensions viz. height, width & depth. Our eye has the ability to visualize everything in three dimensions, but unfortunately no other form of media enables this facility. Images & video that capture the real world tend to have only two dimensions viz. height & width with the depth factor being invariably ignored.

When it comes to high quality videos, high-end gaming etc. 3D imaging has gained importance in the past few years. As 3D images are the closest representations of our real world, these are preferred when it comes to demonstrating concepts, especially in the automotive or health education sectors. Sometimes 3D images are even animated and sound-enabled so as to simulate moving, talking 'live' subjects. These are then converting into 3D videos for 3D television-a relatively new concept in technology.

II. GENERATION PROCESS

The generation of 3D picture is as shown in the figure 1. It consists of mainly three parts namely Edge detection and color segmentation, 3D matrix generation and 3D image modeling.

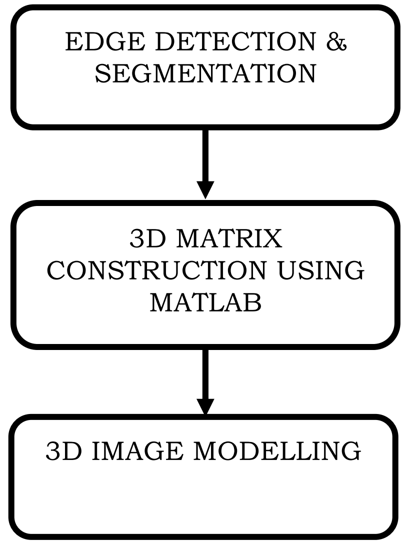

Fig. 1. Design Flow

1) *Edge Detection*

Edge detection provides rich information regarding scene being observed. It helps in extracting the salient features of the image which can be used for further analysis. Edge detection information is used to improve the segmentation of images. Detected edges will help in building the boundaries of the 3D image. The edge detection contains the following steps:

1. Find the gradient of image.
2. Edge Detection of gradient image.

Fig. 2 Original Image

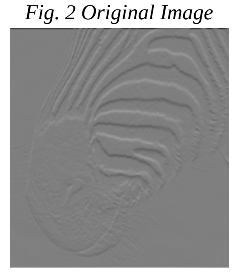

Fig 3. Derivative in y-direction

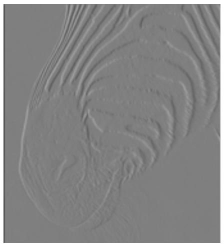

Fig 4. Derivative in x-direction

2) Color Segmentation

In this step segmentation of images is done on the basis of their color. This information will helps in rendering the color information in the 3D picture. Its algorithm follows a novel approach in which the desired color to be segmented is taken as input from the user. Then based on experimental values, the R, G & B channels are compared and an image is formed. The image formed contains the desired colored regions only and the rest of the image is represented by luminance.

Fig 5. Original Image

Fig 6. Color Segmented Image

III. 3D MATRIX GENERATION

1) Symmetric Objects

The symmetric objects are those which can be converted to 3D with the information of any three opposite side. This means only three faces are require creating the 3D object. The three views of an object viz. the top, front and side views convey sufficient information about it. This information can be manipulated to construct a three dimensional matrix representing the edges of the object. Initially, the three views of the object are detected for edges and then used of object construction.

Consider the three views of the object as shown in figures 7 and 8.

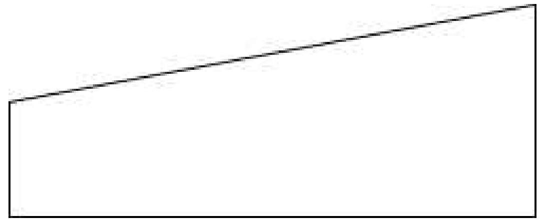

Fig 7. Side View

Fig.8. Front View

The scanning of the front view from left to right, pixel by pixel is done. At the same time, at every pixel we now scan the top view to gain its depth. This means that for every value of x, we gain a unique value of depth z. With this value of x & z the side view is scanned to gain all values of height. In this scanning, for every 1 present at the (x, y, z) coordinate represents an edge at that dimension in the object. Hence, in a way, 3D object can be plotted. This process continues for the complete dimensions of the image.

At the end of this scanning, three-dimensional data of the object is obtained. In fact, this data is four-dimensional in nature. This means that apart from the position x, y and z, the image also has the value 1 or 0, which represents the presence of an edge or otherwise.

2. Algorithm

Step-1: Read the top view, front view & side view images.

Step-2: Calculate the size of all the three views.

Step-3: For every value of x in the front view & every value of z in the top view, determine a unique value of y.

Step-3: At this point x, y, z compare to see if an edge is present or not & store a suitable value in memory.

3) Asymmetric Objects:

For asymmetric objects, we use six different views viz. front, top, bottom, back and two sides.

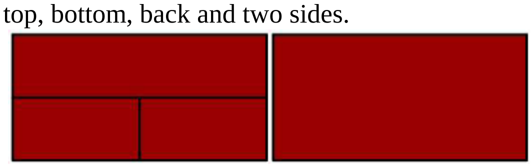

Fig 9. Back and front views

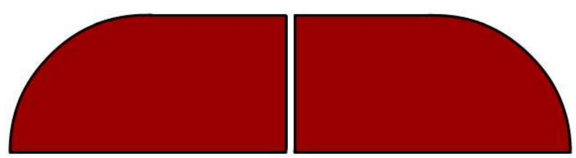

Fig 10. Side Views

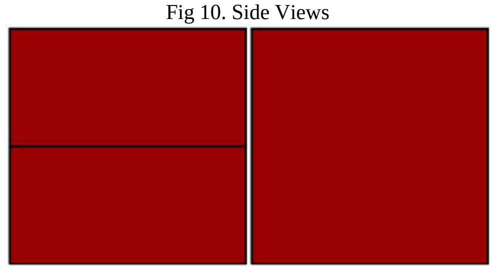

Fig 11. Bottom and Top Views

Beginning from (1,1,1) in 3D space, we check for an edge in all 6 views. If an edge point is detected in a view, then the corresponding points in the other 4 neighboring views are checked for – except the opposite view. In this way, the corresponding location of edge point in 3D space is achieved.

4) Algorithm:

Step-1: Read the top, front, bottom, back and side view images.

Step-2: Calculate the size of all the three views.

Step-3: Beginning from (1,1,1) in 3D space, check for an edge in all 6 views.

Step-4: If an edge point is detected in a view, then check corresponding points in the other 4 neighboring views – except the opposite view.

Step-5: Obtain corresponding location of edge point.

IV.RESULTS

The results are as shown in figure 12 and 13.

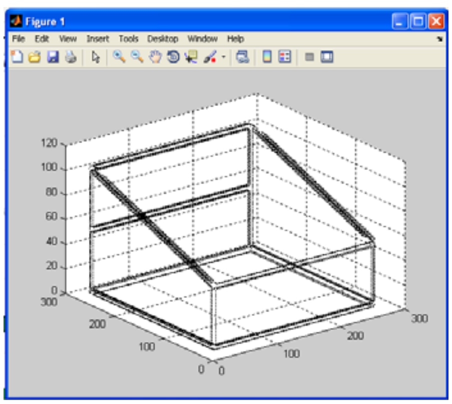

Fig 12 Symmetric and Asymmetric Object Results

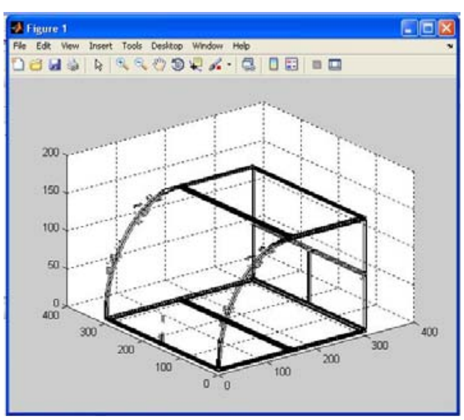

Fig 13. Symmetric and Asymmetric Object Results

V.APPLICATION

This conversion is especially useful for 3D TV imaging. It helps in conservation of bandwidth as 2D image data is converted to 3D at the receiver's end. Another important application is in the field of high-end gaming. Medical imaging techniques also require the use of 2D to 3D image conversion. Security Systems like Parking Assistants convert a 2D picture of a car into 3D in order to search for the most suitable parking spot. Face recognition is also a classic example of this conversion.

VI.CONCLUSION

As we move to the more complex object i.e. the object which has all the sides different and contains complex designs on the sides, the process of 2D to 3D conversion becomes complex. For such pictures even six sides are not sufficient. More robust algorithms and some fast processing tools like VRML can be used for effective 3D modeling. The proposed method is easy and very user friendly for simple 2D to 3D conversion.

VII.REFERENCES

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