Reconstruction of 3 Dimension Object from 2 Dimension Images of an Object using Method of Shocks

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Abstract

Now-a-days, to access any information is not the problem. Internet facilitated the users to have any graphics or textual data at any time any where. Multimedia data is the key player in information transmission and retrieval domain. Multimedia processing is involved in the key areas like business, entertainment, technology, games, and advertisement etc. To improve the visualization of any graphical data, every one want to have the object should be in 3 dimensions. In place of having the video of the particular object, if we have the 2 dimensional images of that object, then question arise- how to get the 3 dimension object from the available 2 dimension images? In literature, this problem is addressed by different solution methodologies and techniques. Prominent from them are: Perspective geometric model; Stereoscopic visualization; Cross eye visualization; Depth map generation; and Using 2 dimension drawings i.e. isometric views.

This paper addresses the above mentioned problem with actual method for conversion of object from 2dimensional images of an object to 3dimesinal object using shock graph method. In this paper, we are mentioning the actual method for conversion. Paper ends with the discussion of the status of our work where we have been reached so far. At the end we can say that still, 3 dimension object formation is the key research area where the researchers are having much more scope to contribute.

Keywords: 2D object, 3D object, Views.

1. Introduction

Multimedia is the key area where the issues of images are discussed and the technologies are developed. 2D images not provide the depth details of any object, so the user generally want to have the more details of the image of object. Only way to have it is the 3D representation or visualization of the object. But the problem is that how to get the 3D object from the 2D image sequences. There are some products or software are available to do this.

In conventional modeling, so called 3D modeling program is used to build an object or scene by adding geometric primitives (e.g. lines, planes, spheres...) one-by-one in a fashion similar to how a 2D picture can be drawn in say MacDraw or xfig. There are several such modelers, e.g. Maya, 3D studiomax, Lightwave, Blender. The three first are commercial programs costing from thousands to ten thousand dollars. The last, Blender can be downloaded for free. Making detailed and realistic models by hand using a modeling program is very tedious and time consuming. It is also difficult to ensure that the manually entered model is a faithful copy of the real heritage object.

In this paper, our objective is to study the procedure to convert the 2D image sequences into the 3D object and finally to develop 3D model. This paper is organized as follows: section 2 deals with the actual procedure for the creation of 3D model from the available two dimensional images of objects: section 3 deals with the shock graph from which is helpful to obtain the 3 Dimensional objects: Paper ends with the conclusion and future scope in section 4.

2. Method for Conversion from 2D to 3D

To convert the 2 Dimensional objects to 3D, the following procedure is to be followed as represented in figure 1.

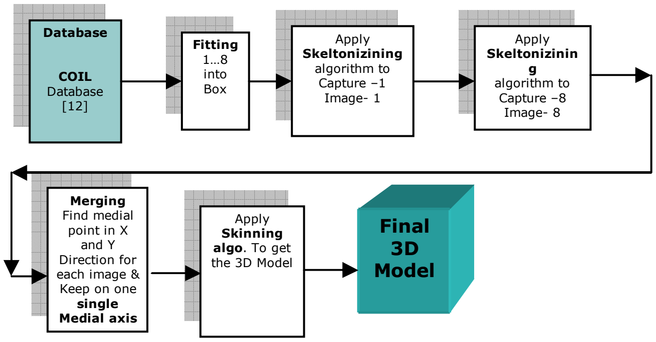

Fig. 1 Complete phases to get 3D Model.

To construct the 3D object from available 2D images or views is basically a very complex problem. In literature, some of the information for model creation is available in [1, 2, 3, and 4]. The complete phases to get the 3D model are as follows.

2.1 Two Dimensional images of Object

Here we are using the 2Dimensional images of the object. This can be done in two ways.

1) Keep the object steady & move the camera around it. Each time the camera should be calibrated five degrees each.

2) Keep the camera steady and move the object around it. Each time the object should be calibrated five degrees each.

The first way is represented Figure 2.

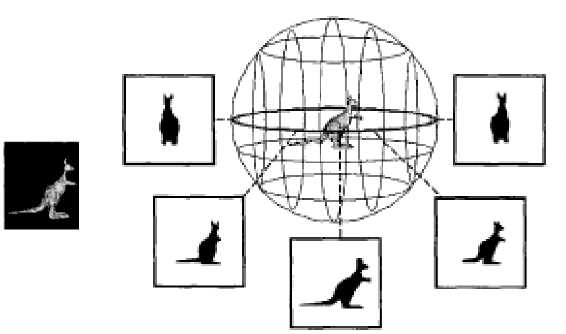

Fig. 2 Walk around Sphere.

Figure 2 representing the view is to be taken into account for the 0 degree or 360 degree view. And in the same manner, if the camera is shifted or an object is shifted by one degree, then total number of views will be 360^2 represented in figure 3.

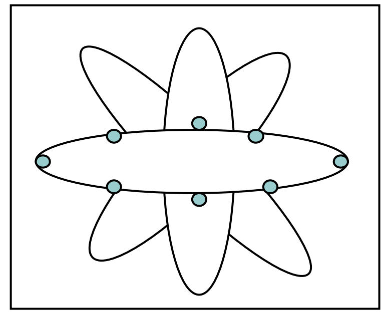

Fig. 3 Total views 360*360

Here for fast processing the COIL database [12] is used.

2.2 Fitting the object into Basic objects

To convert any 2D object to 3D, firstly that object is to be fit into the Box represented in the figure 4. The necessity for this is to while conversion the image boundary will be in the perfect geometry .It will not go beyond that box while processing. The no of basic objects can be Sphere, particles system, patch grids, nurbs surfaces.

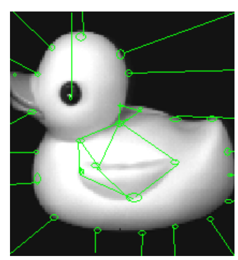

Fig. 4 How to fit an image into the BOX

As we can able to fit the square in circle and vice versa. Like this, we can able to fit the cube inside the sphere and vice versa. In general, any natural objects 2D view can be fit into the circle or ellipse. Our basic idea is that the collection of 2D views of the object can be used to form the 3D object. This collection of 2D views is arranged according to the place and details of view to form the 3D object.

2.3 Finding the mesh structure of the object

To get the mesh structure of the object, any thinning algorithm can be used. Here the method of shocks is used for the same purpose. How the shock graph is used for thinning is explained into the section 3.To get the final 3D model, the total eight mesh structures are considered in the preliminary stage.

2.4 Making the final 3D model

After Finding the different skeleton or wire frame model of the object the arrangement of the midpoint in x & y direction for each image is needed. Using the above Shock graph how the three dimensional object can be created that is explained in the section 3. This approach is even feasible for the objects where there is any curve shape.

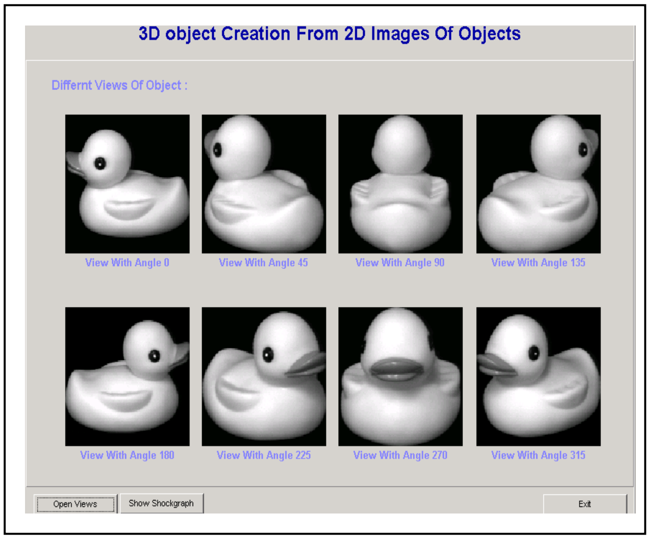

Fig. 5 Taking Eight images of the 2D object with angle difference of 45 degrees using COIL database [12].

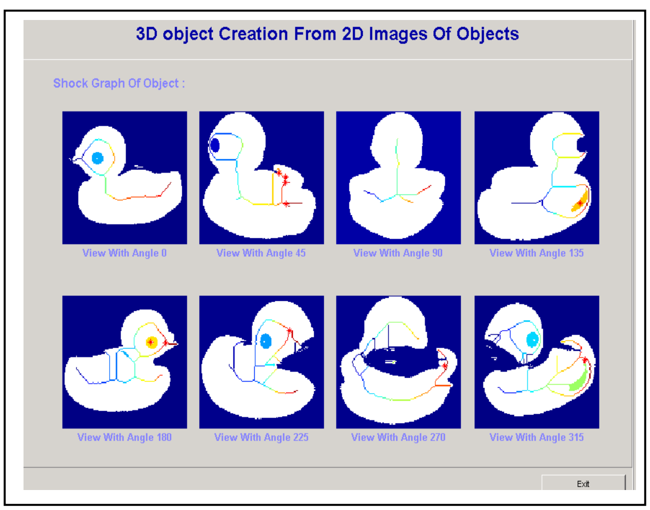

Fig. 6 Skeletons of respective image using Shock Graph.

Above figure 6 shows the skeletons or the mesh structures using shock graph of the eight images of the 2D object with angle difference of 45 degrees.

3. Shock Graphs

The shock graph can be defined as the system of shocks derived from the curve evolution process into a graph.

While doing the conversion from 2 dimensional image to 3 dimensional image the method of shock graph is used. Here while performing the Skelton of the object, we are using four types of shocks represented in the figure 7.For each type of shock the different colors are assigned. While merging, these skeletons about the medial axis depending upon the color of shock the object can be reconstructed, represented in the figure 6.

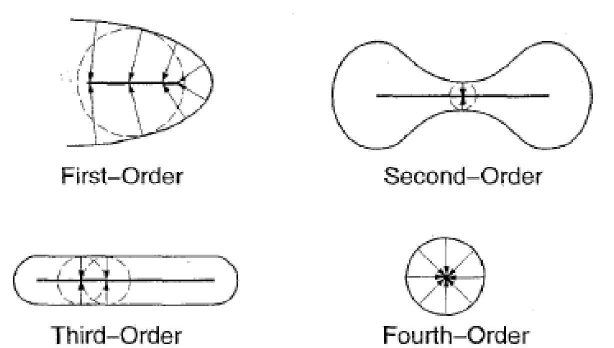

Fig. 7 Types of Shocks

Shocks are categorized into four types.

- An l-shock derives from a *protrusion*, and traces out a curve segment of shocks.
- A 2-shock arises a t a *neck*, and is by two l-shocks flowing away from it
- A 3-shocks correspond to an annihilation into a curve segment due to a *bend*,
- A 4-shock an annihilation into a point or a *seed*.

The shocks are organized into a directed, acyclic shock graph, and complexity is managed by attending to the most significant (central) shape components first.The space of all such graphs is highly structured and can be characterized by the rules of a shock graph grammar. The Shock Graph Grammar (SGG) Grammar for the shock graph can be defined as follows.

G= (V, Σ, R, S)

Where,

V = The set of alphabets

Σ = The set of terminals

S = The Start symbol

R = {R1, R2…R10} the set of Rules.

To illustrate the coloring, while skeltonizing, imagine traversing a path along the medial axis. At a 1-shock the radius function varies monotonically, as is the case for a protrusion. At a 2-shock the radius function achieves a strict local minimum such that the medial axis is disconnected when the shock is removed, e.g., at a neck. At a 3-shock the radius function is constant along an interval, e.g., for a bend with parallel sides Finally, at a 4-shock the radius function achieves a strict local maximum, as is the case when the evolving curve annihilates into a single point or a seed.

4. Experimental Results

For the following chosen object the different views of the image are displayed in the figure 7.These views are taken after each 5 degrees difference. All views are not possible to display. So the views at the difference of 45 degrees are displayed. Results showing the Mesh Structures of the 2D Image in Figure 9. The combined mesh structures of the views are taken into account in figure 10. Results Showing the Mesh structures on medial axis 3D Model

Fig. 7 Displaying an Image

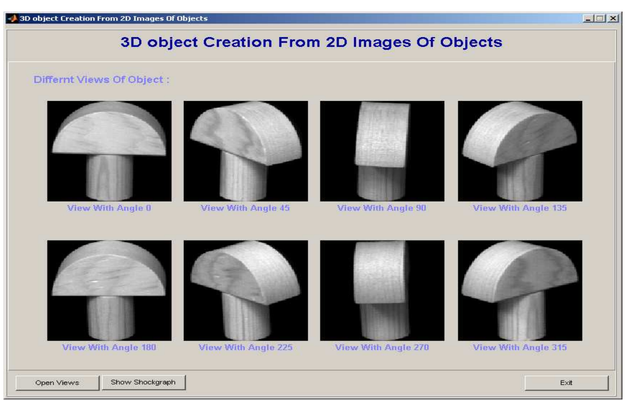

Fig. 8 After Opening all the views of the Image

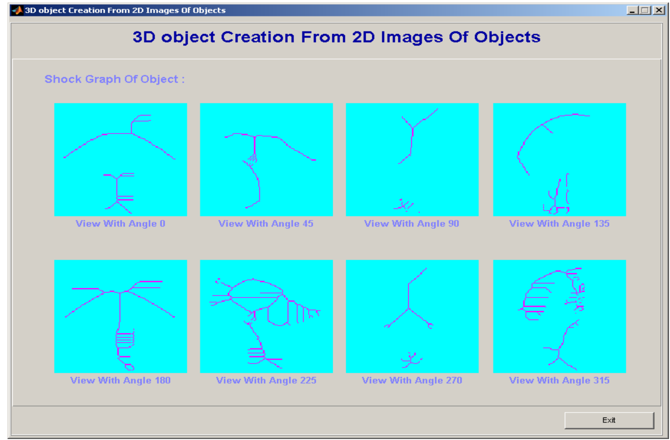

Fig. 9 Results showing the Mesh Structures of the 2D Image

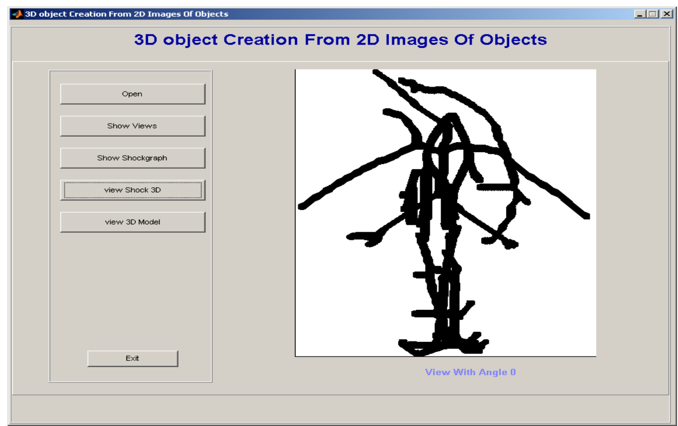

Fig. 10 Results Showing the Mesh structures on medial axis.

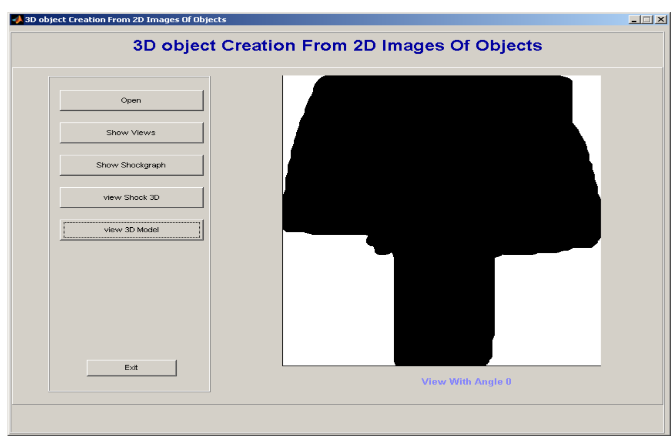

Fig. 11 Results Showing the 3D Model

5. Conclusions

In literature, we found that most of the existing methods to form the 3D objects are based on the image depth calculations. In isometric views, simple geometry calculations are required to make the 3D objects. Some methods deal with the formation of the image model, where the object model is formed first and then the model is post processed.

6. Acknowledgement

Presented work consists of basic idea and the implementations where we have been reached so far. In future, we will go for more number of planar views as well as other views which will be from rotational displacement of camera or an object. Even here we have considered binary image, In future we can go for color images also. If we shift the camera or an object by one degree, then total number of views will be 360^2. In future, our task will be to have 3D object with less number of 2D views or images.

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