

Image Sculpture – From 2D Images to 3D Objects

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Abstract - We introduce a new application for creating 3d objects from 2d images. First we give a motivation for such a program. Then we quickly talk about already known image based modeling programs and their drawbacks. Based on this information we describe our approach and our application. The paper ends with a conclusion and some figures of 3d meshes created with the program.

Keywords – 3D – Computeranimation, 2D Images, 3D Objects, Programming

I. INTRODUCTION AND MOTIVATION

Virtual reality is today and will be in the future even more important [5]. With the development of better hardware it is more and more possible to create realistic worlds. But these scenes still look very sterile maybe because the reality consists of many different objects, whereas today's computer scenes contain only a small amount of objects. One reason for this lack of many objects might be that the modeling of objects is a very time consuming and therefore costly process. Traditional modeling with defining ten thousands of polygons, texture coordinates etc might be a frustrating, monotonous work and also a lot of knowledge and creativity is required to create a good quality 3d mesh. The use of hardware like 3d scanners is very costly and they also have their limitations like object size for example. Therefore a flexible program, with which it is possible to quickly and easily create from 2d images 3d objects would be very useful for nearly everyone possesses a digital camera today. Although there are already some applications which create out of 2d images 3d objects they all have their limitations by trying to make the mesh creation automatically. We instead think that the human is unbeatable in the interpretation of 2d images and that therefore the user should do more work by talking as efficient and intuitive with the program as possible not relying on an automatic technique.

II. IMAGE BASED MODELLING PROGRAMS

Programs like iModeller by UZR or ImageModeller by Realviz use automatic techniques to create from 2d images 3d objects. For example with iModeller the objects have to be placed onto a calibration underground so that the program can calculate out of this extra information the camera positions.

Therefore the application can only work with small objects, which can be placed onto such an underground. Another problem is that the images can only be taken from top so that the underground is visible. Working with ImageModeller the user has to set marker points onto the edges of the 3d objects so that the program is able to automatically calculate the camera positions. ImageModeller works very well with buildings and other artificial objects but has its problems with organic objects. So by using automatic techniques the images have high requirements and therefore the usage of the application is limited.

III. OUR APPROACH

Instead of automatically calculating the camera positions, our program uses the fact that the human is in the interpretation of images unbeatable. If we look at only one image we can immediately imagine this object in 3d because we possess information about the object which cannot be found in the images. For computers lack this information and for it is impossible to give the program this information for all objects, objects have to be placed onto calibration undergrounds or markers have to be set onto edges to give the computer this needed information. But because of this automatic object creation there have to be limitations in usage which lead to high image requirements. Therefore to be as flexible as possible and to be able to handle all kinds of objects we have decided to let the user transform the images. For the user immediately recognizes from which position an image is taken, the key point of the application is to communicate as good as possible with the user so that he can tell the program as simple, intuitive and quickly as possible from where the images were taken.

IV. USER INTERFACE

Therefore the user interface represents the core competence of our product /DoBoKe'04/. We have tried hard to create a very intuitive, cool product with which it is as simple and as effective as possible to create out of 2d images 3d objects. In the following we quickly describe the two processes which have to be done by the user.

A. Binary Image Segmentation

First the user has to lay a mask over the object to tell the program what the object on the image is. To place the mask

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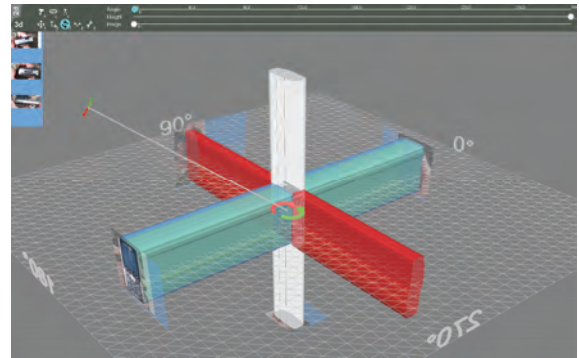
we use many standard tools like brushes, filling, drawing lines and rectangles, shrinking/growing of the mask and threshold. For each operation the user can set specific properties like pen size, fill tolerance, adding or removing the mask etc. It is possible to zoom to the image with the mouse wheel, moving the image around by pressing the right mouse button. The user does not even have to release the brush if he comes to the border which is very frustrating in other applications. The user can use key shortcuts to be even more effective.

B. Image Transformation

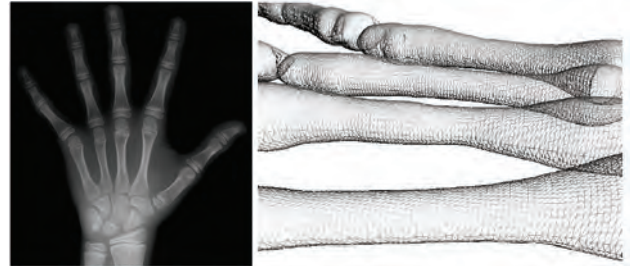
After masking the images the user has to transform the images by rotating, scaling, translating the images and specifying the field of view and how the images should participate in the sculpturing process. Thereby the communication between the program and the user should be as good as possible. The user should tell the program as well as possible how the images should be transformed and the program should present the information as good as possible. We have created a new way to specify these values by moving the mouse cursor around the screen center. With this way by moving with the mouse away from the center the user can move the image very accurate without having to input any numbers. An analogy would be a man showing a crane operator with his arms how he should move the crane. This is very intuitive and analogous. For the representation of the images, 3d clippings of each image get created. These can be presented with transparency or in wireframe. By this way the transformation of the images can be seen very well. The user can always sculpture the final mesh to see how the mesh already looks like. 10 seconds are now needed for sculpturing on an Intel Core 2, 2 GHz, 1024 GB Ram but it will be optimized in the future because seeing the final 3d mesh is naturally the best visual help.

V. CONCLUSION

We have presented an application which creates out of 2d images 3d objects. Thereby we don't use an automated approach but let the user transform the images to be as flexible as possible. Therefore the core feature of our product is the good communication between the human and the computer. Bellow you can see the application and how the images get transformed and some 3d objects which were created with the program. Note that the objects are not taken on an underground but are hold in the hand so the image requirements are very low.



The application: Transforming the images



Bones: Only one image as source. Program creates a rotation symmetric mesh.



Handy: Created in ~5 minutes.



Marlboro: Created in ~5 minutes.

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