

Amazing Sketchbook: extended drawing on a sketchbook using 3DCG

Nanako Kondo Saori Goto Shinji Mizuno
Aichi Institute of Technology
{b13718bb, s_mizuno}@aitech.ac.jp

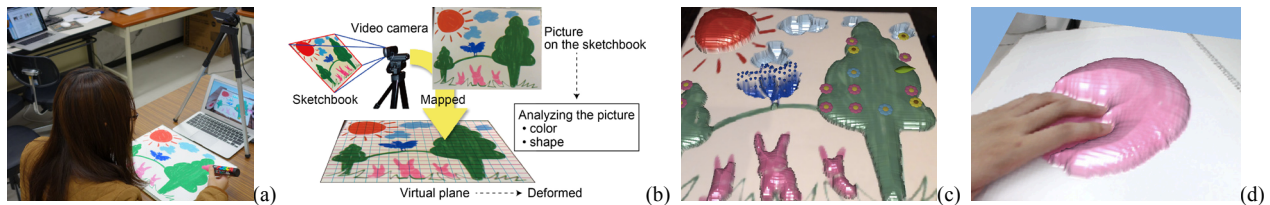


Figure 1: In our tool, a user just draws a picture on an ordinary sketchbook with ordinary color pens (a). A video camera monitors a picture on the sketchbook. The tool analyzes the picture and deforms a virtual plane on which the picture is mapped (b). A 3DCG image is synthesized from the picture in real time (c). It is possible to deform the 3DCG with fingers interactively (d).

1. Introduction

Drawing on a sketchbook is one of the most familiar arts for us, and people of all ages can enjoy it. Thus a lot of CG applications on which a user can create 2D and 3DCG images with drawing operations have been developed [Igarashi et al. 1999]. These applications are useful for many people to create CG without special knowledge or technique. However it is necessary to use special equipment such as an LCD tablet for true drawing operations.

In this paper, we propose a novel media tool "Amazing Sketchbook" that can extend drawing on a sketchbook using 3DCG. A user just draws a picture with ordinary color pens on an ordinary sketchbook. Our tool monitors a picture on a sketchbook, and synthesizes a 3DCG image in real time. Using our tool, a user can enjoy creating a 3DCG image during drawing a picture on a sketchbook and can see changes of the original picture in the 3DCG.

2. Synthesizing a 3DCG image from a 2D image

Figure 1 shows the process of creating a 3DCG image with our tool. Our tool is composed of a PC and a video camera in addition to a physical sketchbook and color pens. The information of the colors of pens is given to the PC. A user draws a picture on the sketchbook with the pens, the video camera of the tool monitors the sketchbook, and the PC synthesizes 3DCG images in real time.

Viewed in extending drawing on a sketchbook, we use a virtual plane constructed of triangular patches and deform the plane to synthesize a 3DCG from a 2D image. The whole virtual plane corresponds to the whole sketchbook. Each frame image of the video camera is mapped on the virtual plane in succession, and the virtual plane is deformed based on the frame images during drawing. As a result, the user could get experience of using special pens that can not only paint, but also deform a sketchbook.

The ways of deformation is decided by analyzing frame images of the video camera. A frame image is separated into regions based on colors. In each region, the distance to the closest background pixel (Figure 2(a)) and the distance to the lowest pixel of the region are calculated for all pixels in the region (Figure 2(b)), and two types of distance

images are generated. The circularity of each region is also calculated. The parts of the virtual plane corresponding to each region are deformed based on the distance images (Figure 2(a)(b)). The way of deformation is changed by the color and the circularity of each region.

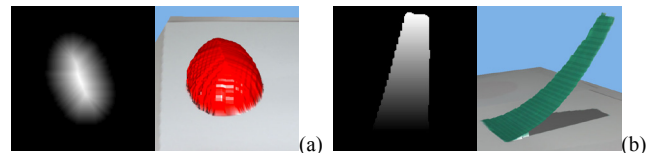


Figure 2: Deformation of virtual plane based on two types of distance images.

3. Experiments

In Figure 3(a), a 3DCG image is generated gradually during drawing a picture on a sketchbook. Yellow and red regions are piled up, flowers are added in green regions, and the parts of the 3DCG image are vibrating. In Figure 3(b), green regions are turned up like a pop-up book. When the user touches the picture on the sketchbook, the distance images are changed and the 3DCG image is deformed interactively (Figure 1(d)). We could observe that many children enjoy extended drawing and gained motivation to draw pictures through the use of our media tool.

Using analyzing results of the picture, it is possible to put various sound sources for each region in the 3DCG space and synthesize stereo sound for the picture interactively [Goto et al. 2013].

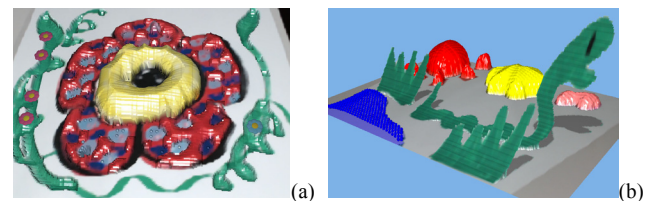


Figure 3: Examples of 3D CG images created by children.

Reference

- IGARASHI, T., MATSUOKA, S., TANAKA, H., 1999, Teddy: A Sketching Interface for 3D Freeform Design, *SIGGRAPH '99*, pp. 409-416.
- GOTO, S., KONDO, N., MIZUNO, S., 2013, RAKUGACKY: making sounds with drawing, *SIGGRAPH 2013 Posters*.