Sketch Interface for 3D Modeling of Flowers

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1 Introduction

3D flower models are important components for impressive virtual reality environments. However, flowers' leaves or petals are 3D free curved-surfaces and they are very difficult to model. We present a user interface with which the user can easily model flowers using freehand sketches. The user interfaces for generation, transformation, and copy are specialized to model leaves and petals, and thus it is more intuitive and flexible compared with rule-based modeling systems or library-based approaches.

2 User Interface

Our platform creates a model from simple strokes sketched on a transparent canvas that the user can move and define. There are two kinds of canvas: a flat canvas (Fig. 2(a)) for drawing leaves or petals and a curved-surface canvas (Fig. 2(c)) for drawing stalks. The flat canvas always parallels the image plane and moves with the camera position. The user can also move it in the depth direction manually.

Figure 1 shows the process of modeling a leaf. The user first draws

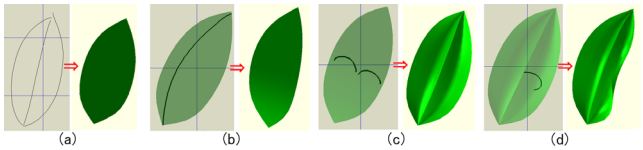

Figure 1: Modeling the leaf

three strokes that represent the outline and center vein of the leaf on the flat canvas; then, a flat leaf object is created (Fig. 1(a)). Next, the user draws strokes on the object in modifying mode to deform the leaf (Fig. 1(b)(c)(d)). These strokes deform the leaf object in the direction perpendicular to the viewing direction. The operations shown in (b) and (c) cause global deformation of the leaf, while the operation shown in (d) deforms the leaf locally. The user can model a flower petal using the same interface.

Figure 2 shows the entire process used to model a Dogtooth Violet. When the user draws a stroke on the ground in create-canvas mode (b), a curved surface canvas is generated by lifting the stroke away from the ground (c) [3]. When the user draws a stroke in stalk mode (d), the corresponding stalk is created (e). In order to place a leaf object in an exact position, the user adjusts the camera and depth of the flat canvas, as shown in (f), and creates the leaf object. The modification strokes are drawn in (g), and (h) shows the completed model. Similarly, a leaf and petal are added in (i) and (j), respectively.

The copy and paste operation is useful because the leaves or petals of a plant resemble each other. If the user selects the source object (k) and draws a stroke on the flat canvas (l), a copy of the object is created along the stroke (m). The size of the copy corresponds to the length of the stroke. The white points attached to the petal or leaf in (k) and (p) are control points. When a leaf or petal object is selected, they appear. The user may manipulate these control points to transform the object. Although it is difficult to create the entire model by operating these control points only, they are convenient for final fine-tuning.

In (n), five copies of a petal are created. The user can move and

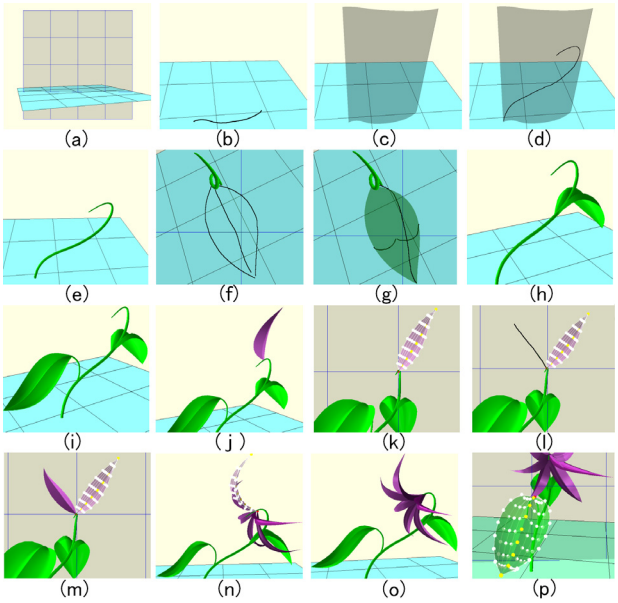

Figure 2: Modeling process

rotate the leaf and petal objects, and the direction and angle of the petals are modified in (o).

3 Results

Figure 3 shows 3D flower models created using our system. It took the author approximately 30 minutes to model them (Tulip, Lily, and Dogtooth Violet). We also asked an inexperienced user to design an original flower model (Figure 3 Orchid). It took the user approximately two hours to learn how to use our system and design this flower. Our interface focuses on modeling the details of plants. In the future, we plan to combine our system with systems for designing the global structure of plants [1][2].

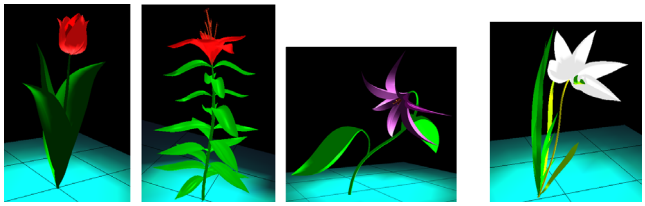

Figure 3: Tulip, Lily, and Dogtooth Violet designed by author, and Orchid designed by test user

References

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