

ユーザインタフェース

~Sketching Interfaces for
Computer Graphics~

五十嵐 健夫

本日の予定

- 講義 (sketching UI)
- 研究室紹介

Schedule

- 6/4 Interface Design, Evaluation
- 6/11 Sketching Interface for Graphics
- 6/18 Human Robot Interaction (課題出題)
- 6/25 休講
- 7/2 Information Visualization
- 7/9 Programming by Example (課題×切)
- 7/16 Real world Computing (課題講評)

前回の内容

- デザインにおいて考慮すべき要素
- デザインの方法 プロトタイピング
- 評価方法
 - テストユーザを使わない評価
 - テストユーザによる評価

今回の内容

Sketching Interfaces for Graphics

- Modeling
- Deformation
- Animation
- Applications

Sketch-Based Interfaces for Interactive Computer Graphics

Takeo Igarashi
The University of Tokyo

Outline

- Introduction
- Application Systems (demo and videos)
 - 2D Drawing
 - Shape Modeling
 - Animation Control
 - Special Purpose Editors
- Summary

Introduction

Motivation

- Traditional graphics tools are too complicated.
 - Only accessible for experts
 - Usable only after initial design is complete



Basic Idea

- Sketching can simplify the process.
 - Accessible for novices
 - Useful for initial design process (quick & simple)



Key Issues

- Sketch is simple = provides limited information
- Key issue in designing sketching systems is “How to infer missing information (e.g. depth)”

Key Issues

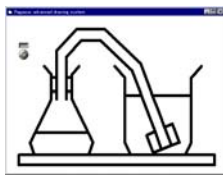
- Sketch is simple = provides limited information
- Key issue in designing sketching systems is “How to infer missing information (e.g. depth)”
- Algorithm: using domain knowledge
- Interface: disambiguation

Outline

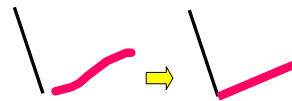
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- Discussion

2D Drawing

Interactive Beautification [Igarashi 97]



Example

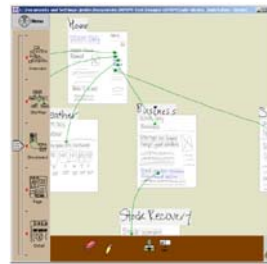


Beautification

- Beautification and prediction in drawing
- Disambiguation by showing multiple candidates

Denim

[Berkley, Lin 2003]



- Web site design
- 手書きのページをブラウジングできる。 [.denim.talk.rn](http://denim.talk.rn)

Music Notepad (Brown Univ.)

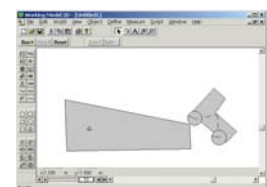
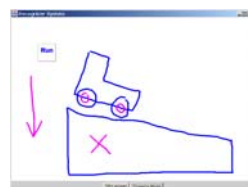


- Music score editing based on gestures

[.musicnotepad.mpg](http://musicnotepad.mpg)

ASSIST

(MIT Media Lab.)



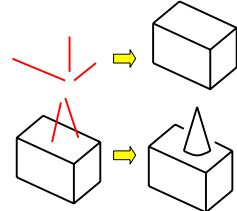
絵を描くと、物理シミュレーションが走る。

[.assist.wmv](http://assist.wmv)

Shape Modeling

SKETCH

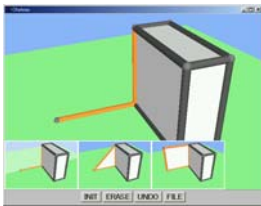
[Zeleznik 96]



- 3D scene construction using gestures.
- "Every object is on top of another object"

Suggestive Interfaces

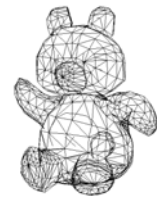
[Igarashi 01]



- User provides hints, system shows suggestions
- Disambiguation by showing multiple candidates

Teddy

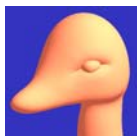
[Igarashi 99]



- Freeform models from sketching.
- "Sketches represent some rotund shapes"

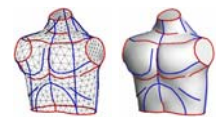
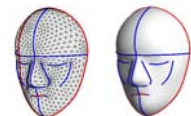
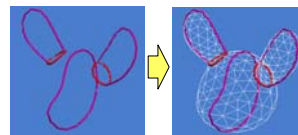
Recent Developments

- Vteddy (voxel models) [Owada 2003]
- SmoothTeddy (subdivision) [Igarashi 2003]
- ShapeShop (implicit surfaces) [Schmidt 2005]
- And more in the afternoon (14:35-)



FiberMesh

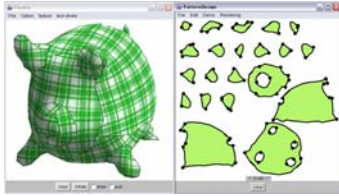
[Nealen et. al. 07]



- The sketch stays on the surface as control curves.
- The surface is computed via optimization.

Plushie

[Mori and Igarashi 07]



- Sketch -> 2D Pattern -> Simulation.
- The user can create physical plush toy.

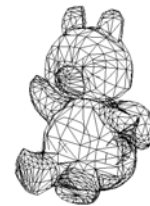
Deformation Techniques

Problem

- How to deform a 3D model by 2D sketching?
 - Sketching skeleton
 - Sketching silhouette

Sketching reference and target (Teddy)

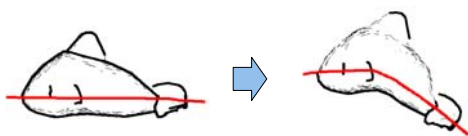
[Igarashi 99]



T. Igarashi, S. Matsuoka, H. Tanaka, "Teddy: A Sketching Interface for 3D Freeform Design" SIGGRAPH 1999.

Sketching reference and target (Teddy)

[Igarashi 99]

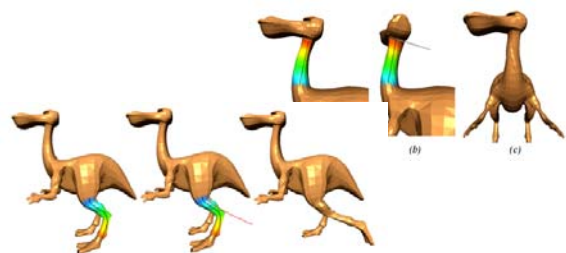


Original Vertex : Reference stroke.
= Resulting Vertex : Target stroke.

- It moves vertices in 2D using the algorithm used in 2D morphing [Beier and Neely 92]

Sketching Skeleton

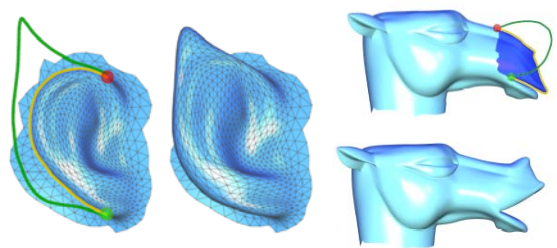
[Kho 05]



Y. Kho and M. Garland. Sketching mesh deformations. Interactive 3D Graphics 2005

[sbime.avi](#)
[silsketch.avi](#)

Silhouette Sketching [Nealen 05]

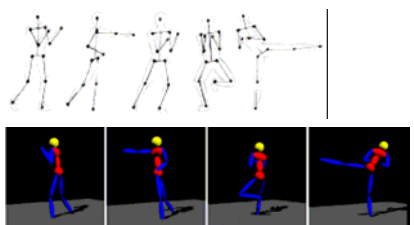


A. Nealen, O. Sorkine, M. Alexa and D. Cohen-Or, "A Sketch-Based Interface for Detail-Preserving Mesh Editing", SIGGRAPH 05

Animation

[videos#Davis03.avi](#)

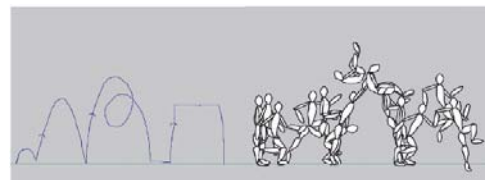
Articulated Animations [Davis 2003]



- The user sketches stick figures.
- Depth disambiguation by selection

[Thorne04.mov](#)

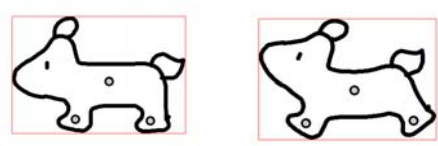
Motion Doodles [Thorne 04]



- The user sketches a desired trajectory.
- "A character walks, runs, or jumps"

[anim](#)

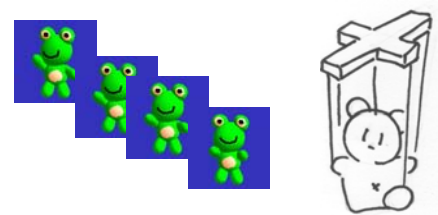
Animations by Performance [Igarashi 05]



- Record the user's operation as an animation.
- Use As-rigid-as-possible deformation.

[run.bat](#)

Animations by Performance [Igarashi 05]



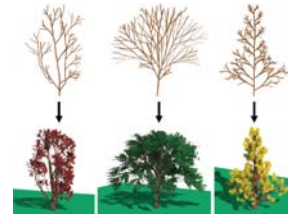
- The user directly performs a motion.
- Blending pre-defined poses

Special Purpose Editors

[videos\OKabe05.mp4](#)

Trees Modeling

[Okabe 2003]



- The user sketches branches and leaves
- “A tree spreads branches to all directions”

[videos\Ijiri05.mp4](#)

Flower Modeling

[Ijiri 2005]

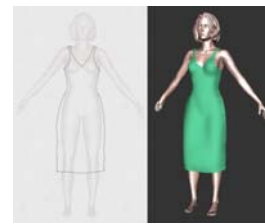


- The user sketches stems, petals, etc.
- The system provides separate UI for each component.

[videos\Turquin04.avi](#)

Garment Design

[Turquin 04]

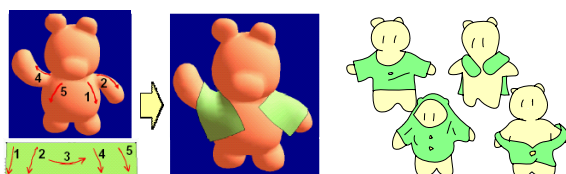


- The user sketches the outline of a garment
- “The garment covers the body surface”

[sweater.bat](#)

Clothing Manipulation

[Igarashi 03]



- The user sketches marks on the body and clothing
- “The clothing covers the body surface”

Summary

- Sketching can simplify interfaces.
 - “Accessible tool for novice users”
 - “Quick exploration of various ideas”
- It requires careful consideration.
 - Infer missing information using domain knowledge
 - Provide a disambiguation interface

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