

ユーザインタフェース

～Sketching Interfaces for
Computer Graphics～

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Schedule

- 6/14 User Interface Design, Evaluation
- 6/21 Information Visualization (課題出題)
- 6/28 Sketching Interfaces
- 7/5 End-user Programming
- 7/12 Real world Computing
- 7/19 Human Robot Interaction
(課題×切 24:00)
- 7/26 課題講評

前回の内容

情報視覚化 (Information Visualization)
情報検索

- Information Visualizer (Xerox PARC)
- Focus + Context, FishEye
- Zooming UI
- HCIL (Shneiderman)
- Tool Glass and Magic Lenses

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

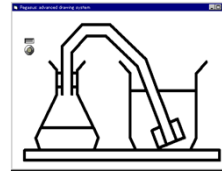
Outline

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

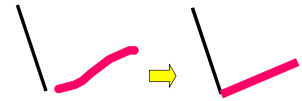
2D Drawing

Interactive Beautification [Igarashi 97]

pegasus-e



Example

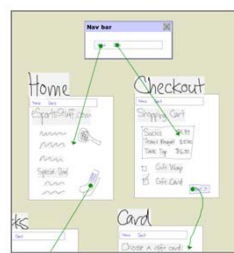
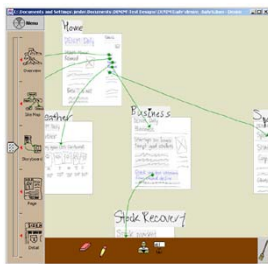


Beautification

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

Denim

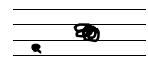
[Berkley, Lin 2003]



- Web site design
- 手書きのページをブラウジングできる。

E:\movies\sketch\denim_talk.rm

Music Notepad (Brown Univ.)

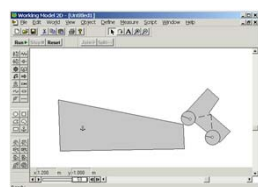
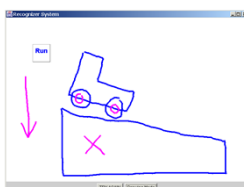


- Music score editing based on gestures

E:\movies\sketch\musicnotepad.mpg

ASSIST

(MIT Media Lab.)



絵を描くと、物理シミュレーションが走る。

E:\movies\sketch\assist.wmv

Shape Modeling

SKETCH [Zeleznik 96]

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

[E:\movies\sketch\sketch.avi](#)

Suggestive Interfaces [Igarashi 01] [Chateau.bat](#)

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

Teddy [Igarashi 99] [test.html](#)

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

FiberMesh [Nealen et. al. 07] [JaliceTeddy](#)

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

Plushie [Mori and Igarashi 07] [.. plushie.mp4](#)

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

SketchChair TEI 2011

With Greg Saul

- The user draws the outline.
- The system analyzes ergonomics and structure.
- The user constructs the real chair.

[chair.mov](#) [chair](#)

Metallophone Design with FEM

With N. Umetani, K. Takayama, J. Mitani



- The user designs a metallophone
- The system computes the tone in real time.

[delfem](#)

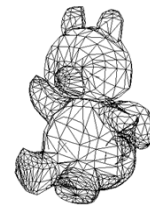
Deformation Techniques

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]

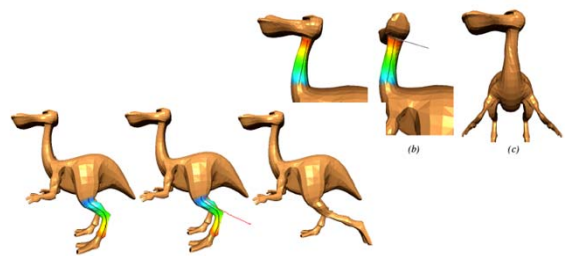


Original Vertex : Reference stroke.
= Resulting Vertex : Target stroke.

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

Sketching Skeleton

[Kho 05]



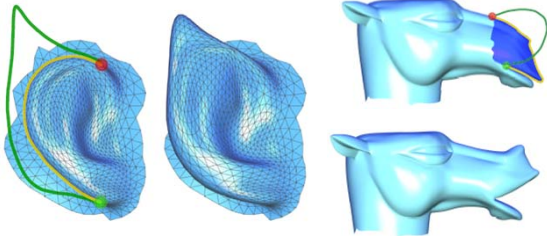
Y. Kho and M. Garland. Sketching mesh deformations. Interactive 3D Graphics 2005

[E:\movies\sketchmodeling\sketching_mesh_deformations.mov](#)

E:\movies\sketchmodeling\sbime.avi
E:\movies\sketchmodeling\silsketch.avi

Silhouette Sketching

[Nealen 05]



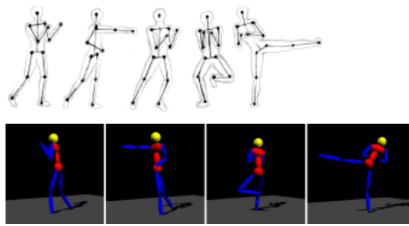
A. Nealen, O. Sorkine, M. Alexa and D. Cohen-Or, "A Sketch-Based Interface for Detail-Preserving Mesh Editing", SIGGRAPH 05

Animation

E:\movies\sketchmodeling\Davis03.avi

Articulated Animations

[Davis 2003]

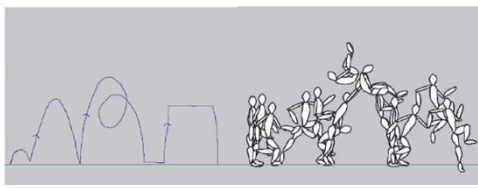


- The user sketches stick figures.
- Depth disambiguation by selection

E:\movies\sketchmodeling\Thorne04.mov

Motion Doodles

[Thorne 04]

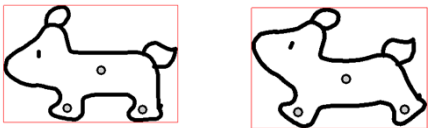


- The user sketches a desired trajectory.
- "A character walks, runs, or jumps"

anim

Animations by Performance

[Igarashi 05]

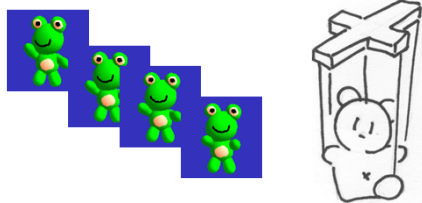


- Record the user's operation as an animation.
- Use As-rigid-as-possible deformation.

run.bat

Animations by Performance

[Igarashi 05]



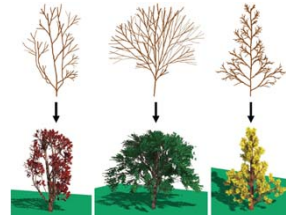
- The user directly performs a motion.
- Blending pre-defined poses

Special Purpose Editors

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Trees Modeling

[Okabe 2003]

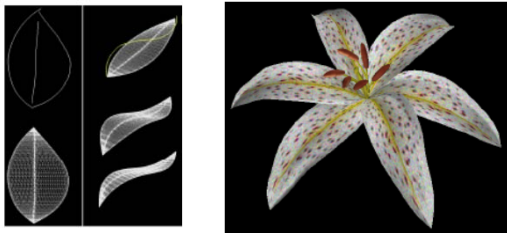


- The user sketches branches and leaves
- "A tree spreads branches to all directions"

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Flower Modeling

[Ijiri 2005]

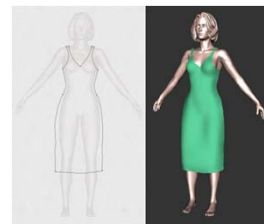


- The user sketches stems, petals, etc.
- The system provides separate UI for each component.

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Garment Design

[Turquin 04]

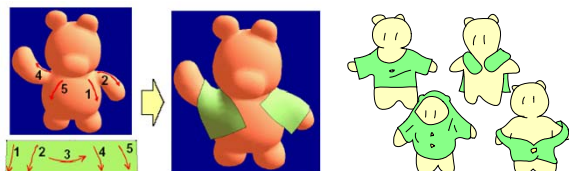


- The user sketches the outline of a garment
- "The garment covers the body surface"

sweater

Clothing Manipulation

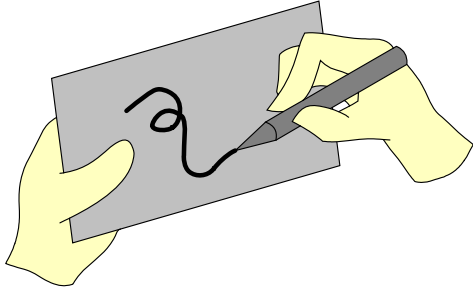
[Igarashi 03]



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

Sketching in 3D

3-Draw [Saches 91]



Freeform

[SensAble Tech.]



カ学フィードバック付3次元入力デバイスでモデリング

[..paint.avi](#) [..smooth.avi](#)

SurfaceDrawing

[Schkolne 2000]



[..schkolne.mov](#)

CavePainting

[Keefe 2001]



[bucket.avi](#)

[..grapes.avi](#)

Sketch Furniture

[FRONT]



sketchfurniture

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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