

Example-based Illustrative Modeling and Rendering

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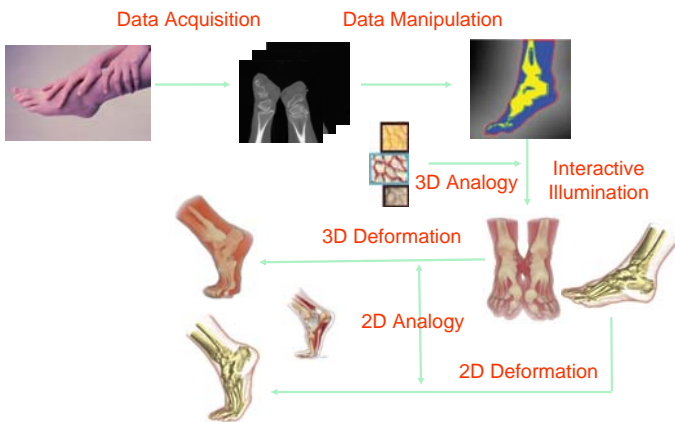


Motivation

- ❖ Learn from examples for case that are difficult to represent and model
 - Existing 2D illustrations
 - Existing models and datasets

- ❖ Fulfill example-based illustration by means of
 - Shape deformation
 - Texture synthesis

Computer-generated illustration



Overview

- ❖ Shape and shape variations by examples
 - Convey objects from measured datasets
 - Interactive shape manipulation
 - Example-based shape transfer

- ❖ Appearance and rendering styles by examples
 - Texture synthesis and transfer
 - Rendering styles by examples

Modeling from measured data

- ❖ Boundary shapes
 - Iso-surface [Lorraine87]
 - Volumetric image processing [Whitaker00]
 - Transfer function-based [Kitware]



Modeling from measured data

❖ Structural information

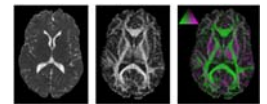
- CT [Dong05]
- DTI [Wenger04]



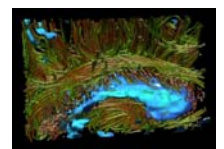
Visible Human



Modeled



DTI data

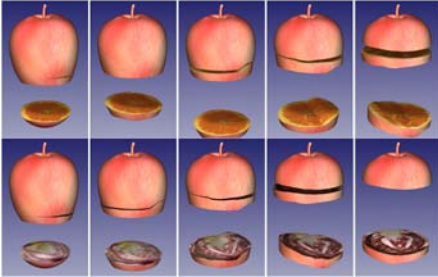


Fiber illustration

Modeling from measured data

❖ Texture and appearance

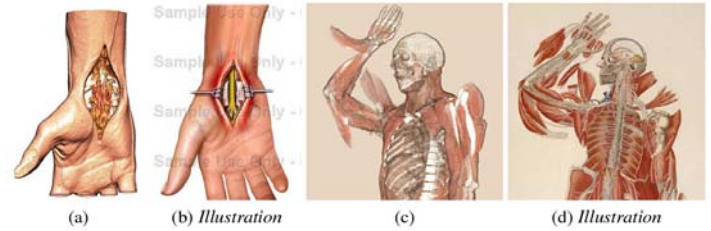
- Vision [Dorsey04]
- Capture [Gross07]



Interactive manipulation

❖ Volume deformation

- See Carlos D. Correa



Interactive manipulation

❖ Surface deformation

- Freeform deformation
- Skeleton deformation
- Mesh deformation



[Func06]



[Sederberg86]



[Ju06]



[Yu05]

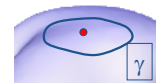
Example based shape transfer

❖ 3D to 3D [Sorkine04, Yu04]

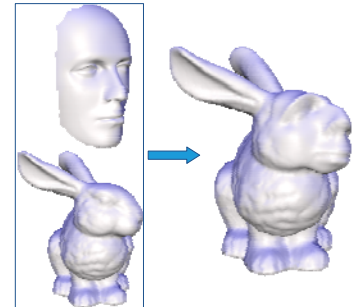
- Transfer locally encoded details



$$\delta_i = \frac{1}{d_i} \sum_{v \in N(i)} (v_i - v)$$



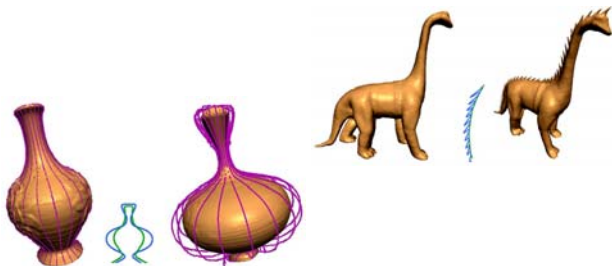
$$\frac{1}{len(\gamma)} \int_{v \in \gamma} (v_i - v) ds$$



Example based shape transfer

❖ 2D to 3D [Zelink04]

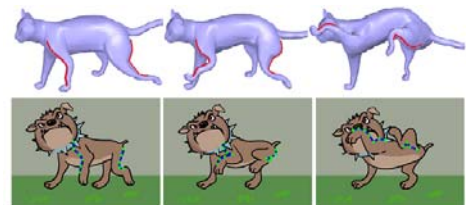
- Using curves to modify surface contour



Example based shape transfer

❖ 2D to 3D [Zhou06]

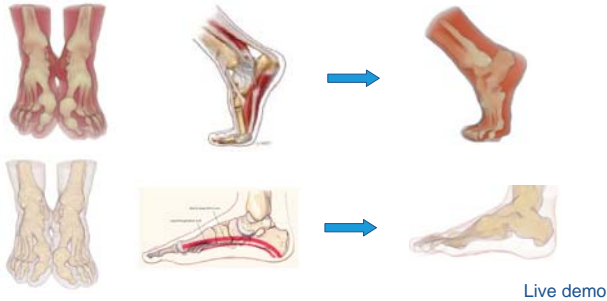
- Using curves to drive deformation



Example based shape transfer

❖ 2D to 3D [Chen07]

- Using curve to drive deformation



Example based shape transfer

❖ 2D to 3D [Chen07]

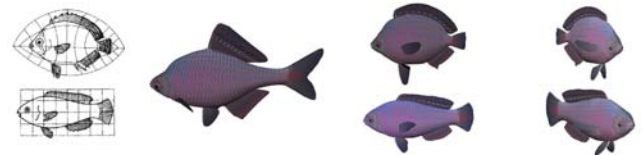
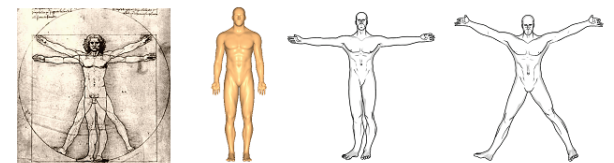
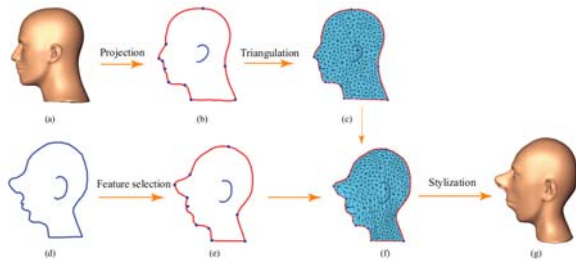
- Using distance field to convert surface to data to get smooth boundary effects



Example based shape transfer

❖ 3D stylization from 2D example

- Context curves, silhouette, feature points, local geometric details

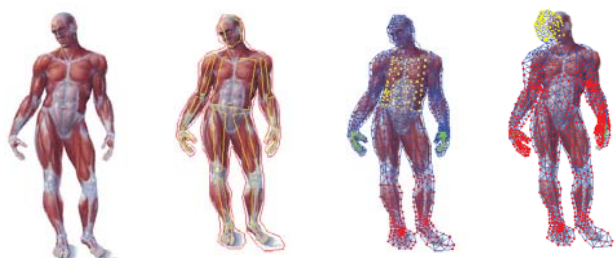


Video demo

Example based shape transfer

❖ 2D deformation by example

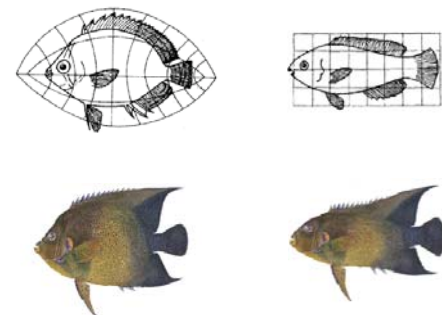
- Differential based 2D mesh manipulation



Example based shape transfer

❖ 2D deformation by example

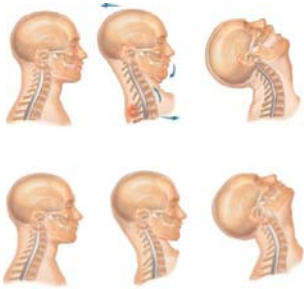
- Example-based shape manipulation



Example based shape transfer

❖ 2D deformation by examples

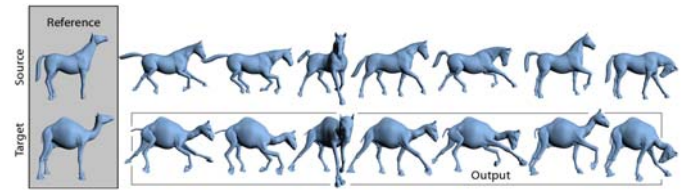
- Flexible post-process to modify the results



Video demo

Example based deformation transfer

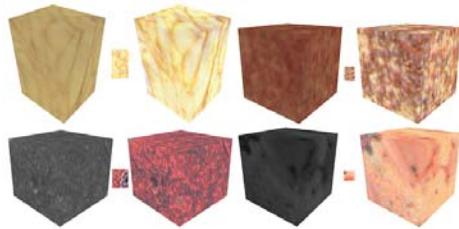
❖ 3D to 3D [Sumner04]



Example-based appearance transfer

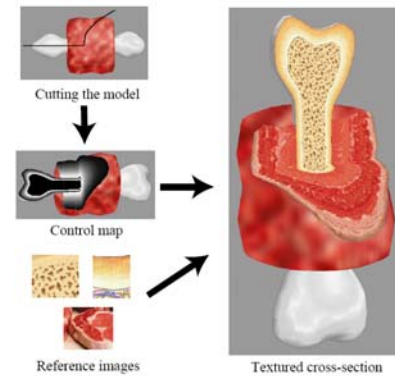
❖ Color transfer [Lu05]

- Simple representation and similar distribution



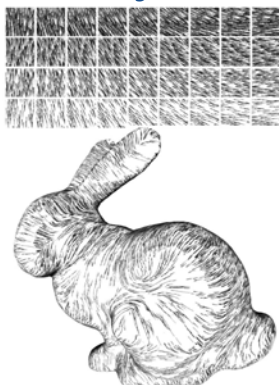
Example-based appearance transfer

❖ 2D texture synthesis [Owada04]



Example-based appearance transfer

❖ Surface texture synthesis [Gorla03]



Example-based appearance transfer

❖ Solid texture synthesis [Lu05]

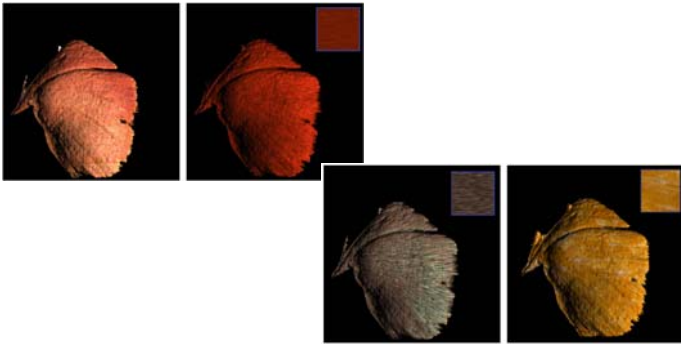
- Simulate styles of professional illustrators
- Simplify user interaction



Example-based appearance transfer

❖ Solid texture synthesis [Dong05]

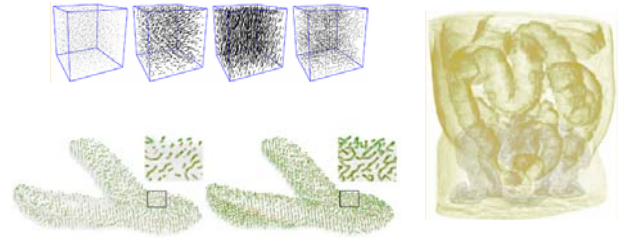
- Synthesize the texture guided by the vector field from visible human



Example-based appearance transfer

❖ Solid texture synthesis [Lu07]

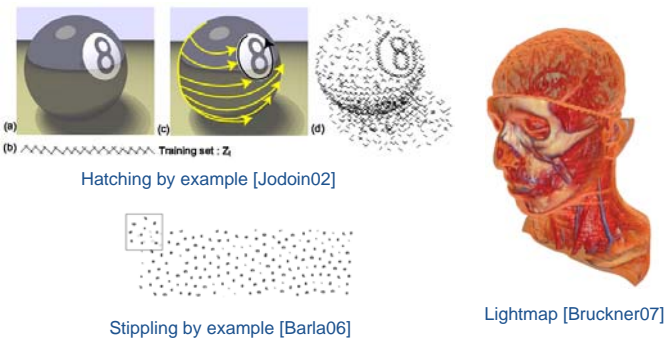
- Wang cube for non-periodic patterns



Colon & Pelvis

Example-based appearance transfer

❖ Rendering styles transfer



Hatching by example [Jodoin02]



Stippling by example [Barla06]

Lightmap [Bruckner07]

Conclusions

- ❖ Transfer intrinsic features from multiple sources
- ❖ Employ multiple styles in illustrations
- ❖ Always keep the user in the interaction loop

Acknowledgments

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