Example-based Illustrative Modeling and Rendering

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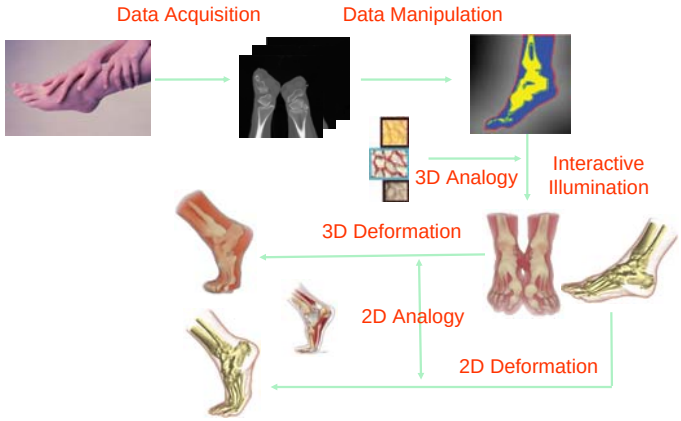
Motivation

- **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

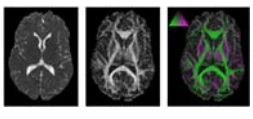
Modeling from measured data

- **Boundary shapes**
  - Iso-surface [Lorrence87]
  - Volumetric image processing [Whitaker00]
  - Transfer function-based [Kitware]

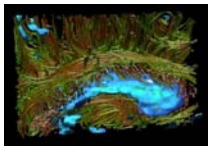
Modeling from measured data

- **Structural information**
  - CT [Dong05]
  - DTI [Wenger04]

Visible Human Modeled



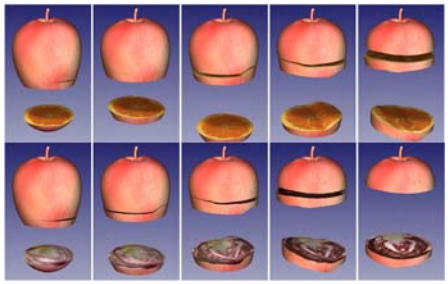
DTI data

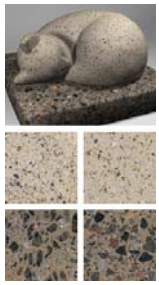


Fiber illustration

Modeling from measured data

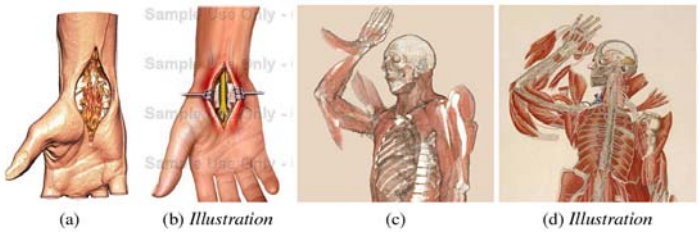
- **Texture and appearance**
  - Vision [Dorsey04]
  - Capture [Gross07]





Interactive manipulation

- **Volume deformation**
  - See Carlos D. Correa



Interactive manipulation

- **Surface deformation**
  - Freeform deformation
  - Skeleton deformation
  - Mesh deformation

[Funck06]

[Sederberg86]

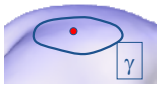
[Ju06]

[Yu05]

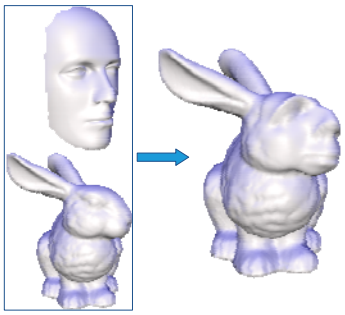
Example based shape transfer

- **3D to 3D [Sorkine04, Yu04]**
  - Transfer locally encoded details

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

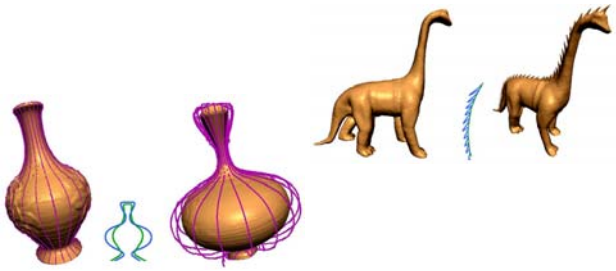


$$\frac{1}{len(\gamma)} \int_{v \in \gamma} (v_i - v) ds$$



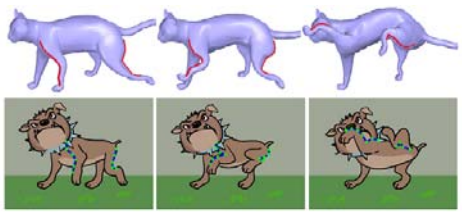
Example based shape transfer

- **2D to 3D [Zelink04]**
  - Using curves to modify surface contour



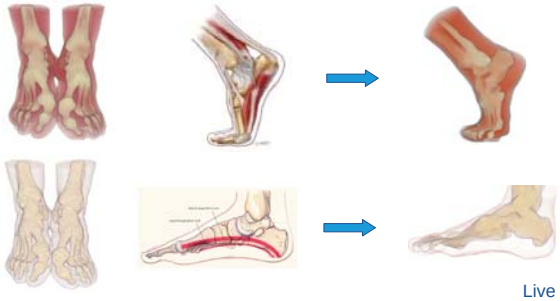
Example based shape transfer

- **2D to 3D [Zhou06]**
  - Using curves to drive deformation



Example based shape transfer

- **2D to 3D [Chen07]**
  - Using curve to drive deformation



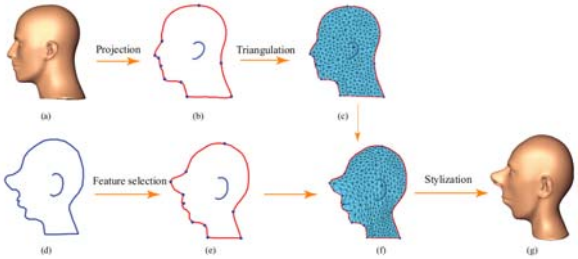
Live demo

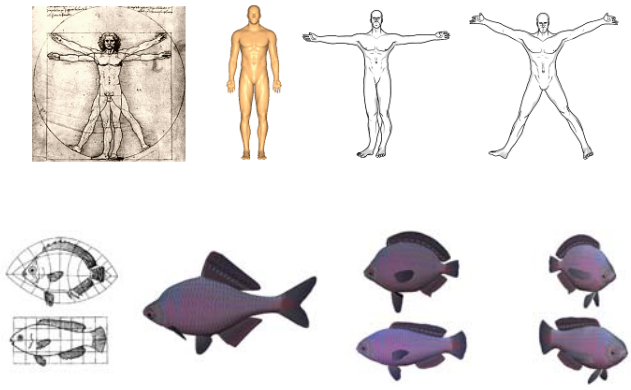
Example based shape transfer

- **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

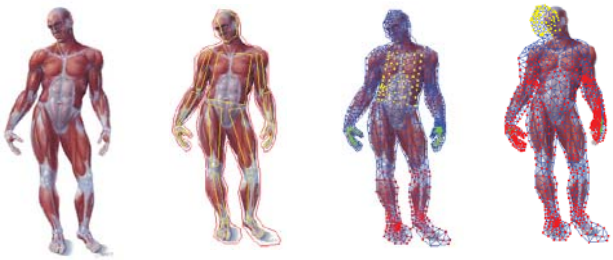




Video demo

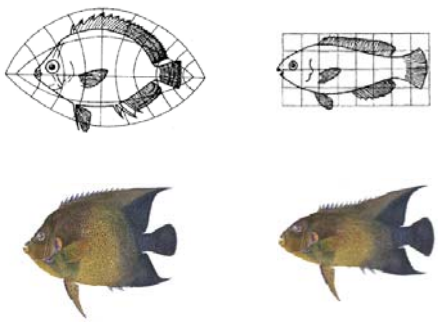
Example based shape transfer

- **2D deformation by example**
  - Differential based 2D mesh manipulation



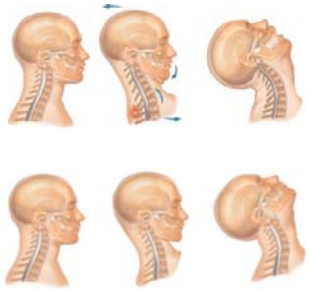
Example based shape transfer

- **2D deformation by example**
  - Example-based shape manipulation



Example based shape transfer

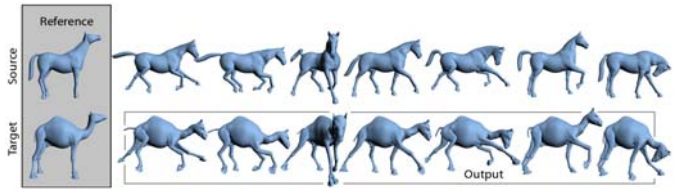
- **2D deformation by examples**
  - Flexible post-process to modify the results



Video demo

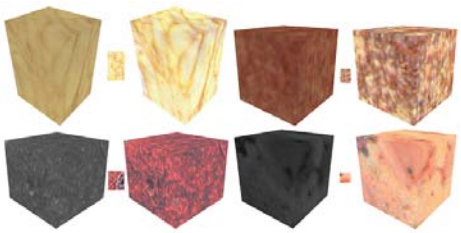
Example based deformation transfer

- **3D to 3D [Sumner04]**



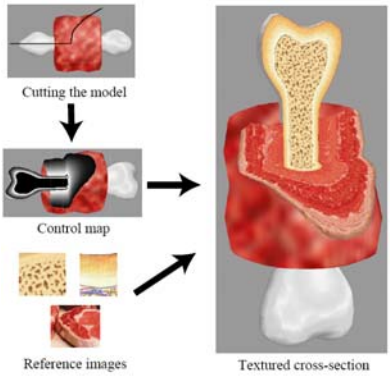
Example-based appearance transfer

- **Color transfer [Lu05]**
  - Simple representation and similar distribution



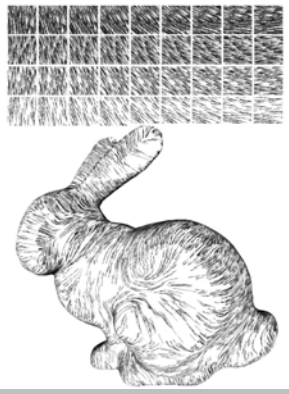
Example-based appearance transfer

- **2D texture synthesis [Owada04]**



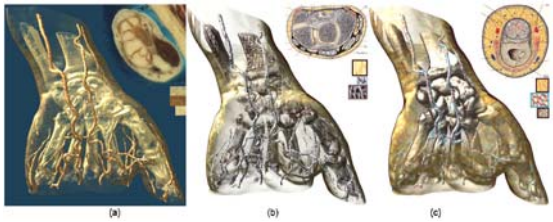
Example-based appearance transfer

- **Surface texture synthesis [Gorla03]**



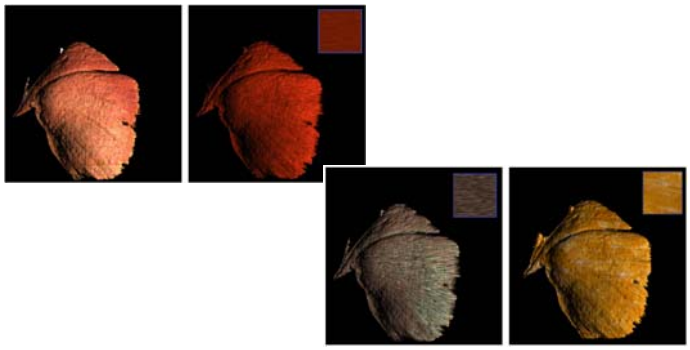
Example-based appearance transfer

- **Solid texture synthesis [Lu05]**
  - Simulate styles of professional illustrators
  - Simplify user interaction



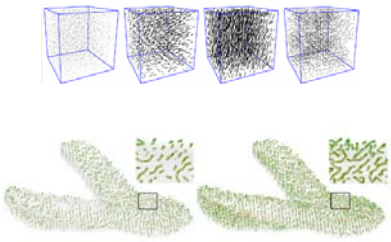
Example-based appearance transfer

- **Solid texture synthesis [Dong05]**
  - Synthesize the texture guided by the vector field from visible human



Example-based appearance transfer

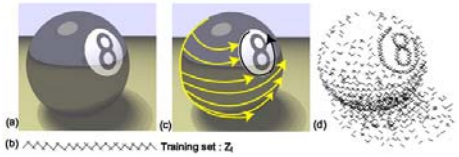
- **Solid texture synthesis [Lu07]**
  - Wang cube for non-periodic patterns



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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