Modelling 3D Avatar for Virtual Try on

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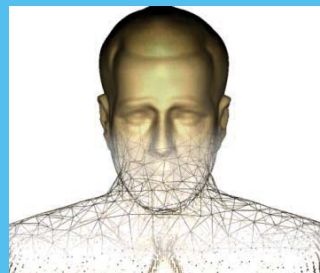
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Creating Digital Humans

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Gypsum Statue of Humphrey Bogart

Meshgrid plotted on the statue with a pencil

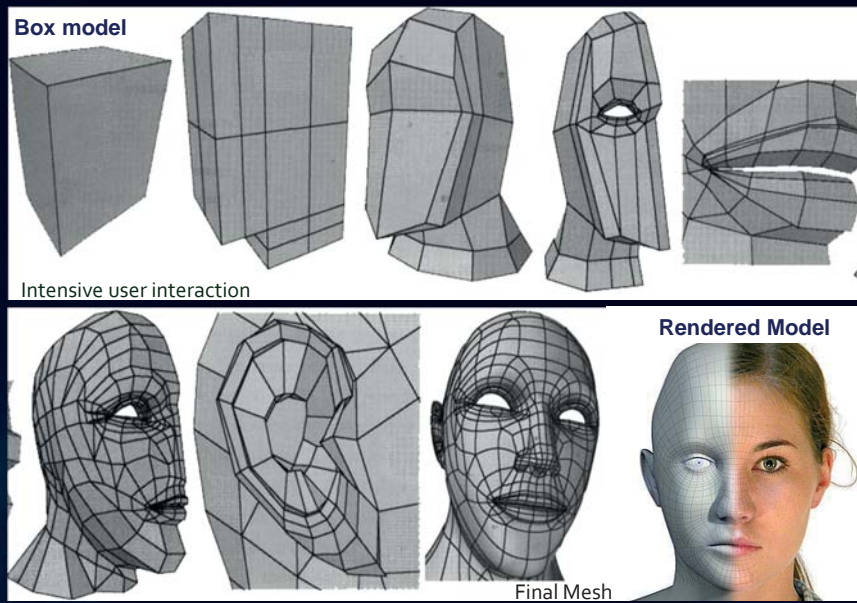Vertex by vertex, each coordinate is transferred into the computer intuitively

Model is rendered

Some other models that are used for modeling(1987)
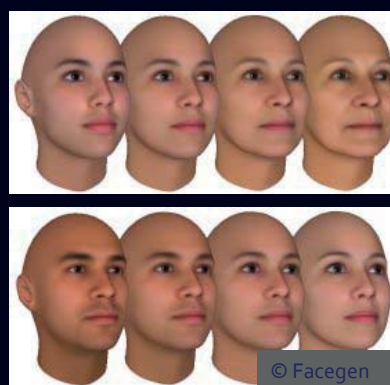
Creating Digital Humans

Box model

Intensive user interaction

Rendered Model

Final Mesh

- Free-form interactive modeling with a geometric primitive.

Peter Ratner, 3-D Human Modeling and Animation, Wiley Pub.
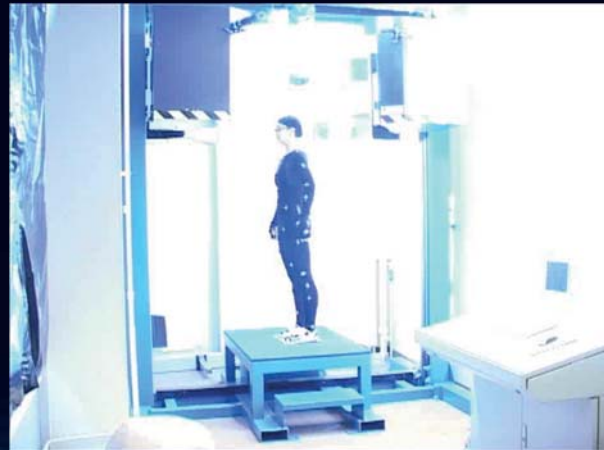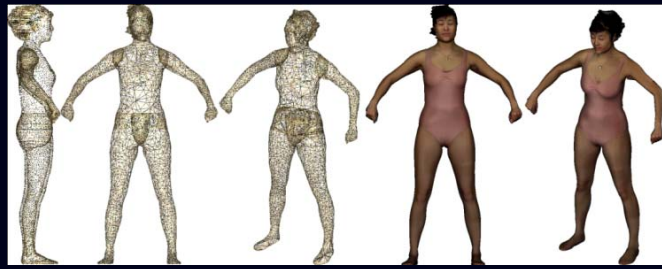

Creating Digital Humans

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Digital human modeling software

© Facegen

-Uses Template
  -Models
  -Postures
  -Motions
  -Gestures
  -Textures

Creating Digital Humans

-Acquires precise surface structure.

Creating Digital Humans

- 3D body scanner
  - Image based 3D scanner
  - 80 compact cameras synchronized and control from a single computer placed on hexagonal structure

- Output:
  - 80 pictures taken simultaneously from various angles
  - 3D reconstructed avatar

3D scanner setup
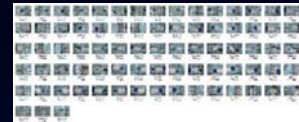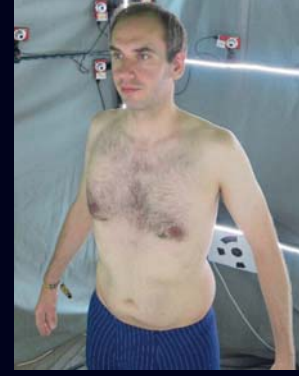
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Creating Digital Humans

- Post processing using agisoft photoscan
  - Generate automatically mask to facilitate reconstruction
  - Remove green artefact on the skin to improve texture quality

Raw data

Mask

Color correction

Modeling Pipeline

Body Scan

| Scanner System	Almost automatic			3DS Max and MIRALab plugins some user interaction				Industry Standard COLLADA format	Rapid Visualization Environment
Raw data (Point cloud)	- Outlier Filt. - Noise Filt. - Smoothing - Hole Filling	Triangulation	- Skeletonize - Skinning	Segmentation	Customized Body Size	Skeleton Adaptation		Animated Model	Efficient Rendering
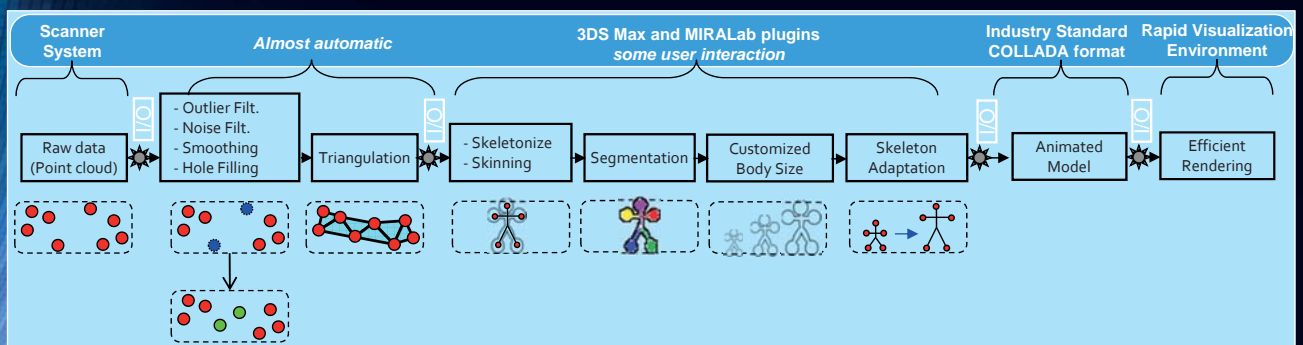
Characters Animation

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Early Cloth Simulation Models at MIRALab

- B. Lafleur, N. Magnenat-Thalmann, D. Thalmann, Cloth Animation with Self-Collision Detection. Proc. IFIP Conf. on Graphics Modeling, Tokyo, Japan, Springer, pp. 179-197, 1991

- M. Carignan, Y. Yang, N. Magnenat-Thalmann, D. Thalmann, Dressing Animated Synthetic actors with Complex Clothes. Computer Graphics (Proc. SIGGRAPH '92), ACM Press, Vol. 26, No. 2, pp. 99-104, 1992

FLASHBACK

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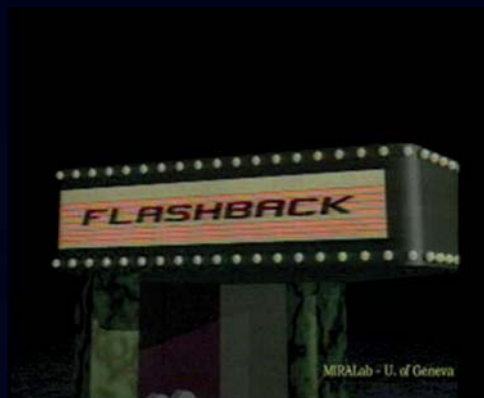
Problems to be solved in Clothing Research

Mechanical Properties of Cloth

- How to describe the mechanical behavior of cloth.

Mechanical Modeling

- How to simulate these properties on virtual cloth.

Numerical Integration

- How to solve the differential equations resulting from the mechanical model.

Collision Detection

- How to detect efficiently contacts between cloth and other objects.

Collision Response

- How to take into account these contacts in the simulation.

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1. Mechanical Properties

- Internal Forces (From surface deformations)
  - Elasticity (metric, curvature)
  - Viscosity
  - Plasticity

- External Forces (From environment interactions)
  - Gravity, Air Viscosity
  - Contact reaction, Friction
  - Miscellaneous Interactions

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2. Mechanical Modeling

- Representation of Mechanical Parameters on a Virtual Cloth Surface

  - Geometrical modeling:
    Surface discretization
    - Triangles, Quadrangles,…
    - Polygons, Bezier patches, …
    - Regular grid, Arbitrary topology,…

  - Animation:
    Time discretization
    - Successive frames along time.

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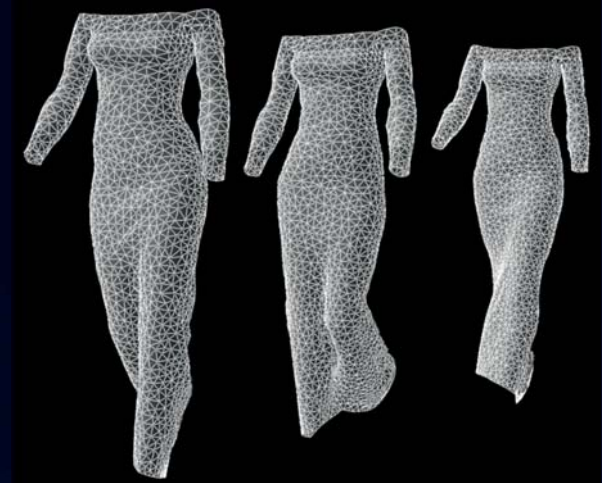
3. Numerical Integration

- The mechanical model defines a law relating force to position and speed.

$$F(P(t), P'(t))$$

- Newton's law relates acceleration to force and mass:

$$F = M\ P''(t)$$

- A differential system should be resolved along time
  - Huge number of degrees of freedom:
   - Efficient methods are needed.

$$M\ P''(t) = F(P(t), P'(t))$$

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4-5 Collision Detection and Response

- **Integrating Collision Effects in the Mechanical Model**
  - Reaction Effects
    - Prevent interpenetration of surfaces.
    - Necessary for geometrical consistency.
  - Friction Effects
    - Dissipative forces that oppose sliding.
    - Contribute to realistic contact effects.
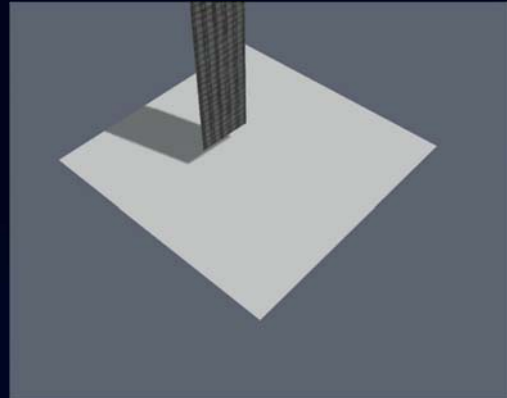
Exhibition Robert Piguet

- **Exhibition Robert Piguet : "High Fashion in Equations"**
  - Project in collaboration with The Swiss Fashion Museum of Yverdon-les-Bains, Switzerland

- **Context of the collaboration**
  - The Swiss Fashion Museum of Yverdon-les-Bains had the privilege of receiving 3,000 original sketches made by several trainees of renowned Designer Robert Piguet. The exhibit, titled Exposition Robert Piguet: From1933 to 1951, traces Mr. Piguet's career.

Exhibition Robert Piguet

- New ideas are illustrated with aesthetic drawings.

Sketches by Marc Bohan, Hubert de Givenchy and Serge Guérin

Exhibition Robert Piguet

- Having the desired 3D shape in mind, the 2D patterns are designed by experts according to pattern construction rules:

Exhibition Robert Piguet

Model designed by Givenchy

Exhibition Robert Piguet

Model designed by Guèrin

Exhibition Robert Piguet

Model designed by Givenchy

Exhibition Robert Piguet also film selected at SIGGRAPH ELECTRONIC THEATER (2007, San Diego, USA)
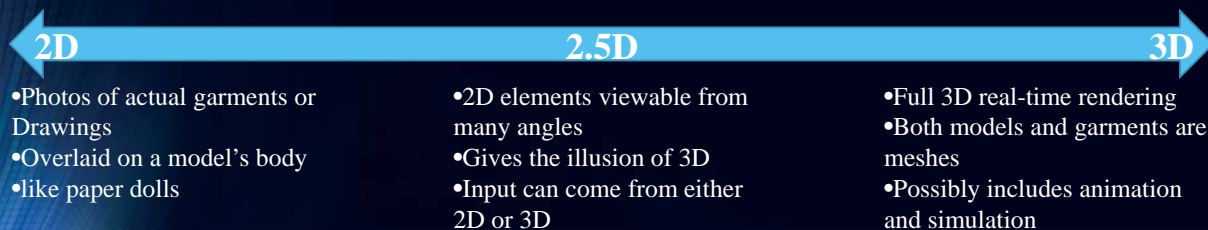
What is a Virtual Try On?

- An (online) application, allowing you to try on virtual objects (before purchase).

- There are many (online) examples
  - Jewelry
  - Watches
  - Glasses
  - Garments

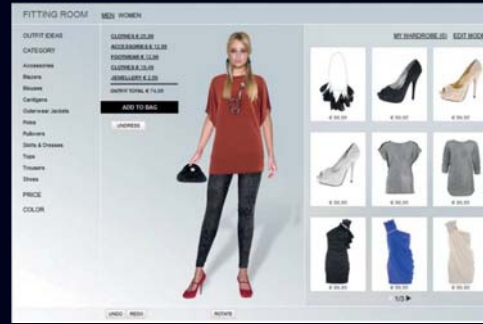

A Virtual Try On for garments

- A Virtual Try On for garments has been approached from many different angles
  - Evaluate garments for style
    - The commercial majority falls into this category
  - Evaluate garments for fit
    - Academic research and some commercial solutions

- A spectrum of approaches

2D	2.5D	3D
•Photos of actual garments or Drawings •Overlaid on a model's body •like paper dolls	•2D elements viewable from many angles •Gives the illusion of 3D •Input can come from either 2D or 3D	•Full 3D real-time rendering •Both models and garments are meshes •Possibly includes animation and simulation

VTO Approaches: 2.5D

My Virtual Model

Mimic Me

Optitex 3D Virtual Clothing

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Our Virtual Try On: Overview

- 3D Application
- Real-time simulation of garments
- Try-On using Virtual Human
- Real-time 3D avatar creation based on user morphology
- Garments customisation
- Virtual mirror using Microsoft Kinect
- Multi-device and multi-user system

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Our Virtual Try On: Body sizing

- An accurate body is essential
  - To "try on" clothing, you need a virtual body that represents your own

- Start from a template body
  - Generate a body with your sizes based on anthropometric data
  - Use a picture of the user to increase immersion and realism

Interface and Interaction

- Kinect client
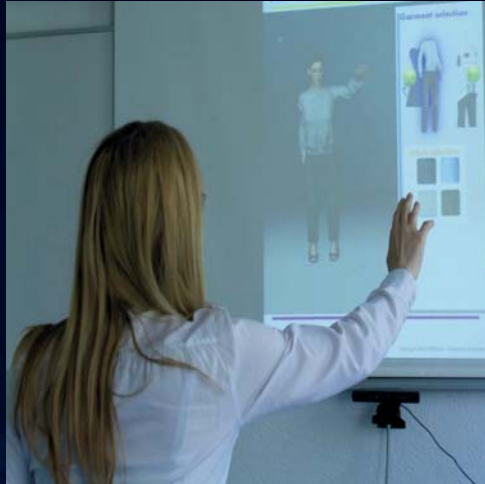 - Morphology extraction using depth image
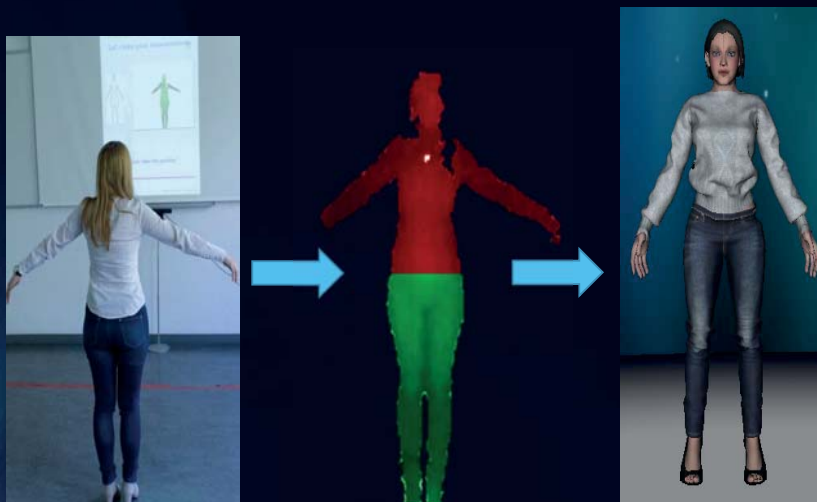
Interface and Interaction

- Kinect client
  - Real-time reconstruction of the animation

Our Virtual Try On: Demo

Thank you for your attention