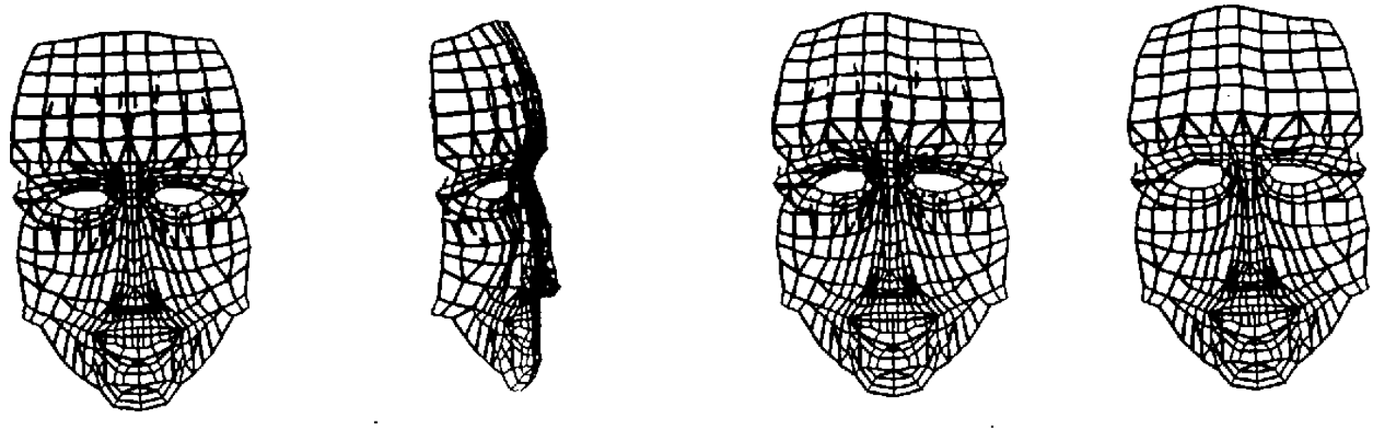
Face Modeling & Simulation

- Pioneers : Platt & Badler, "Animating Facial Expressions", SIGGRAPH'81

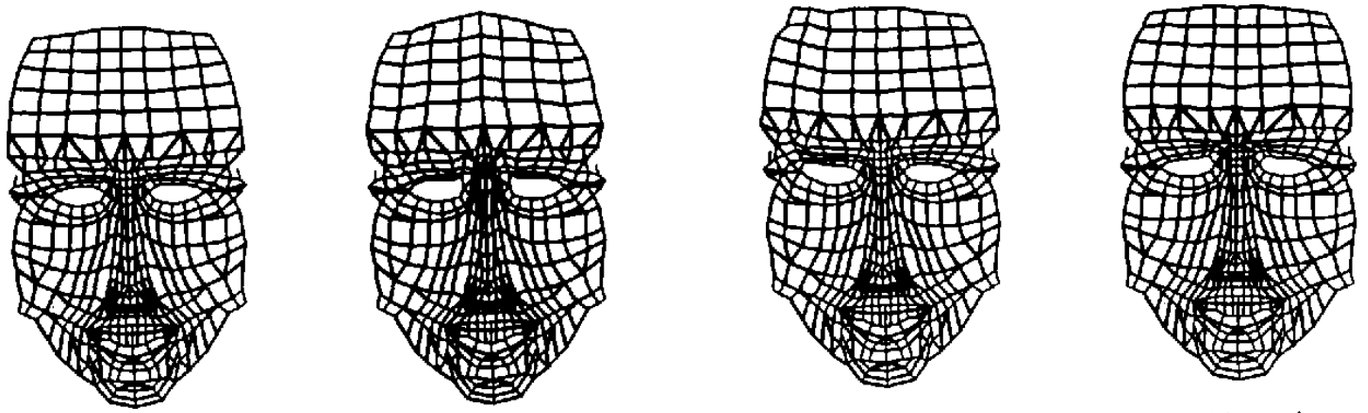


(a) no expression, with muscles

(b) no expression, with muscles, profile

(c) AU R1, with muscles

(d) AU R1

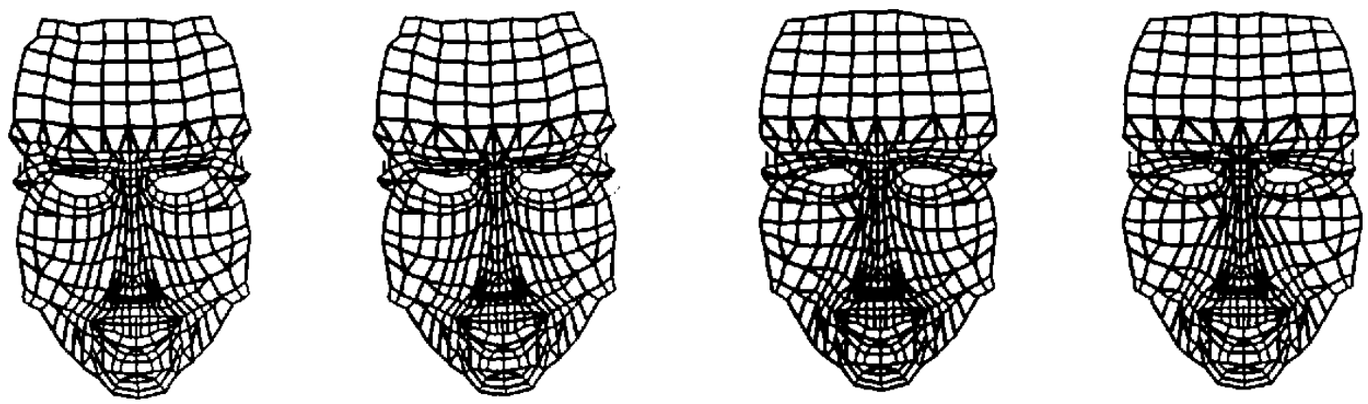


(e) no expression

(f) AU 1

(g) AU R2

(h) AU 4



(i) AU 2

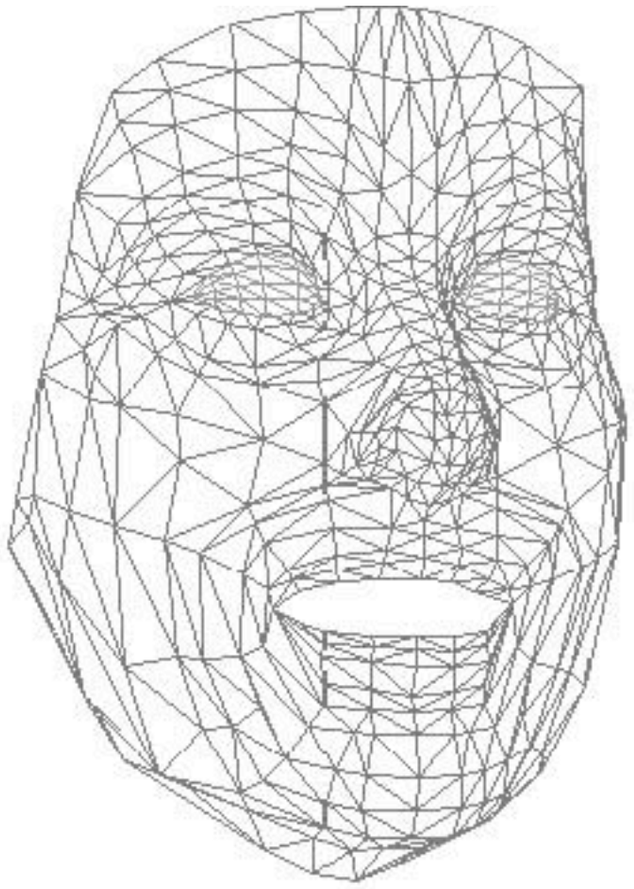
(j) AU 2+4

(k) AU R6

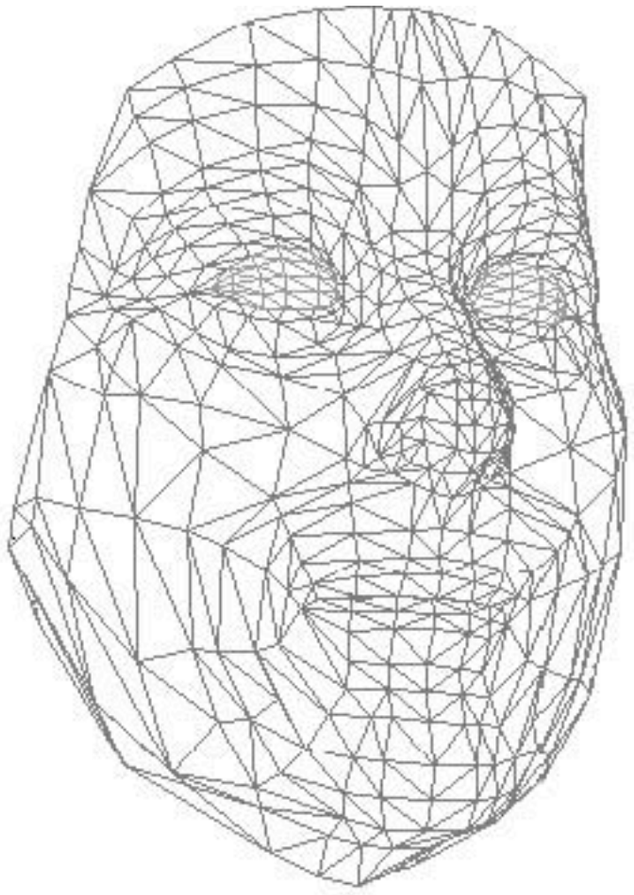
(l) AU 4+6

Face Modeling & Simulation

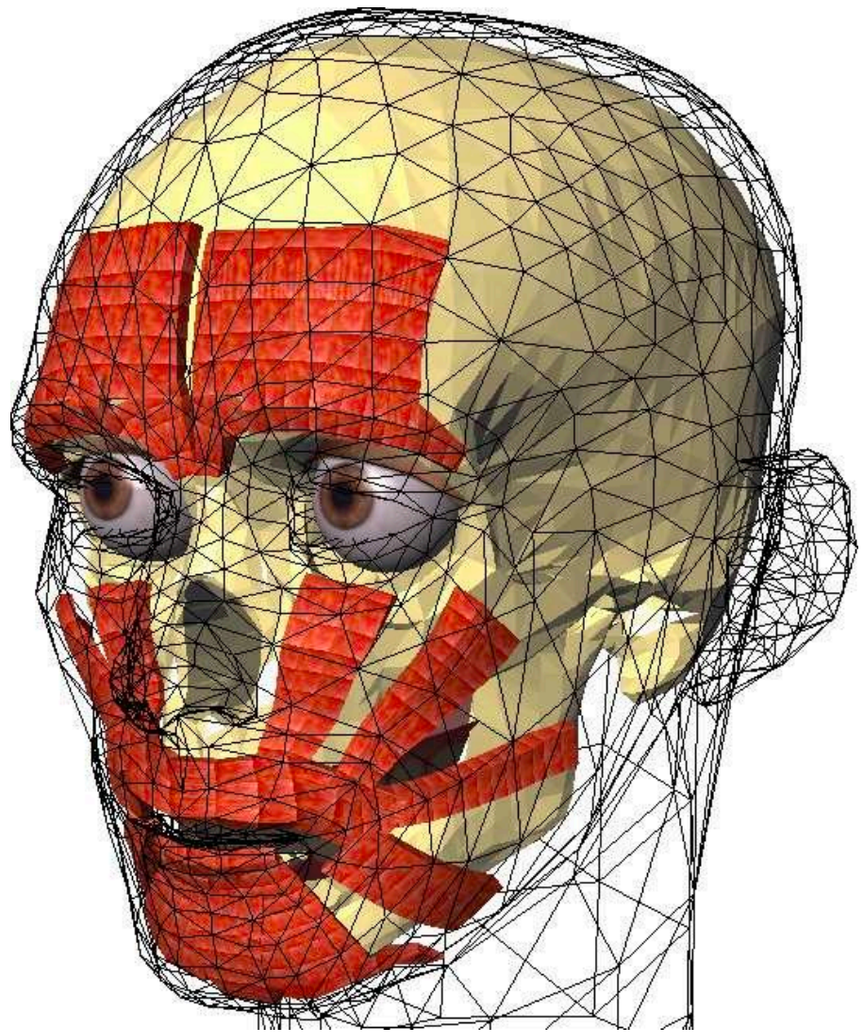
- Lee et al, "Realistic Modeling for Facial Animation", SIGGRAPH'95
- Kahler et al, "Head shop: generating animated head models with anatomical structure", SIGGRAPH'02



(a)



(b)

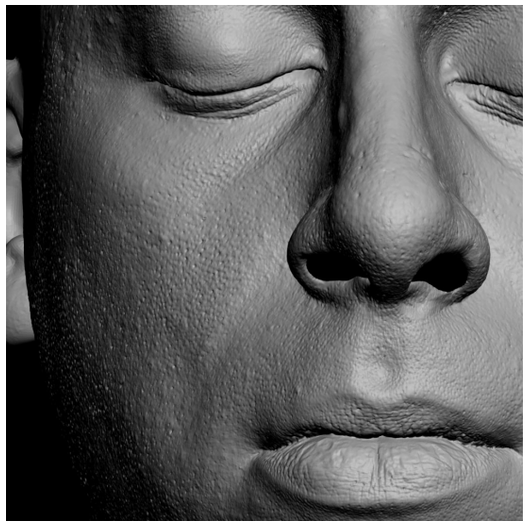


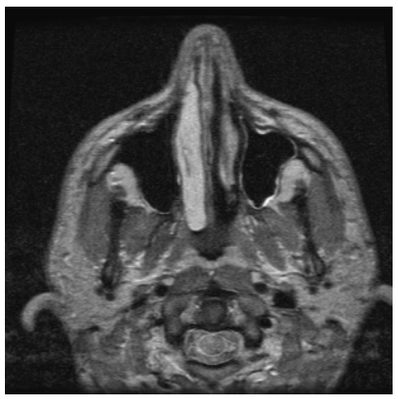
Face Modeling & Simulation

- Sifakis et al, "Simulating Speech with a Physics-Based Facial Muscle Model", SCA 2006
- Sifakis et al, "Automatic Determination of Facial Muscle Activations from Sparse Motion Capture Marker Data", SIGGRAPH 2005

Modeling pipeline

Laser scans

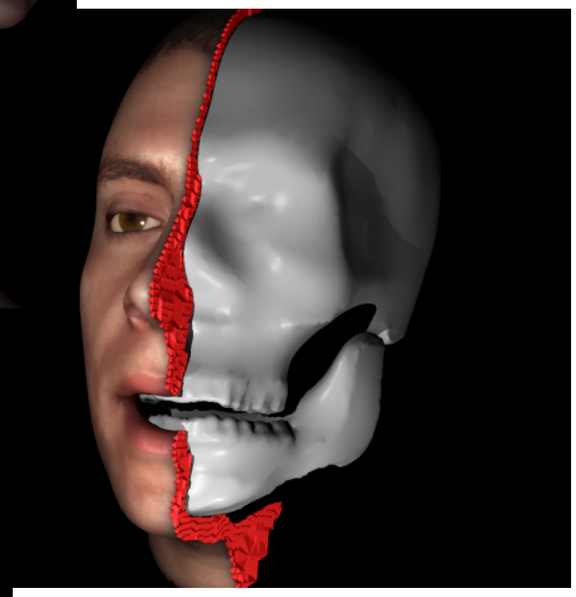




Medical imagery

Anatomical datasets

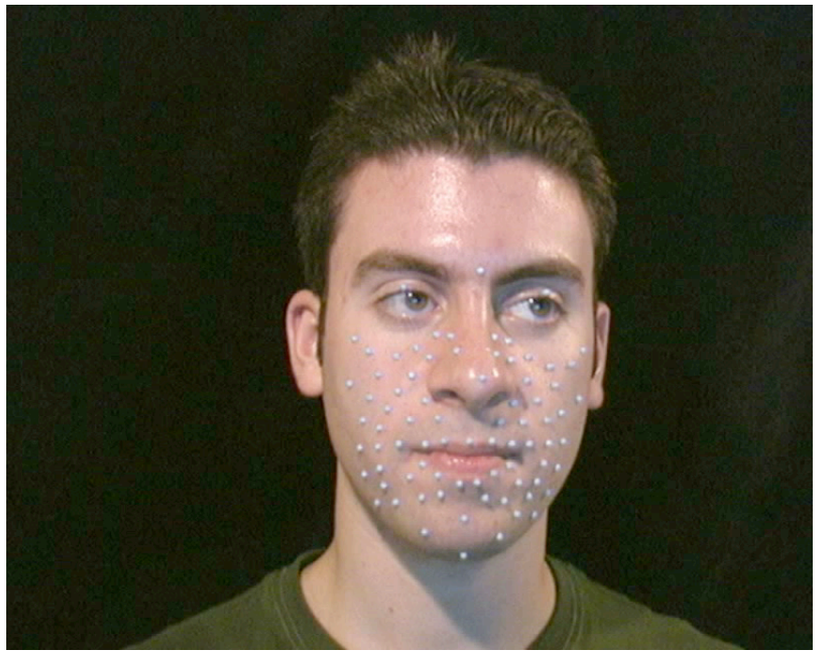
Flesh geometry



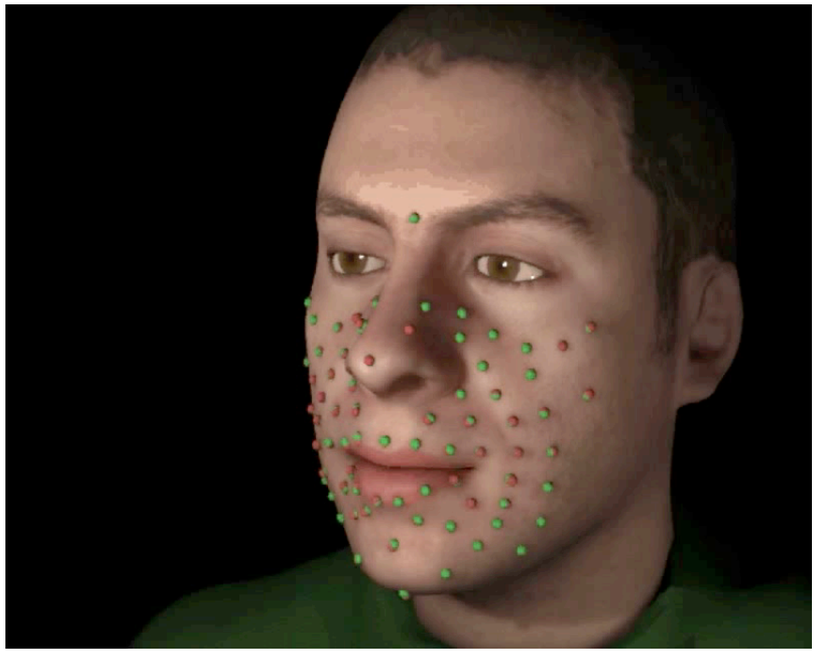
Volumetric simulation mesh

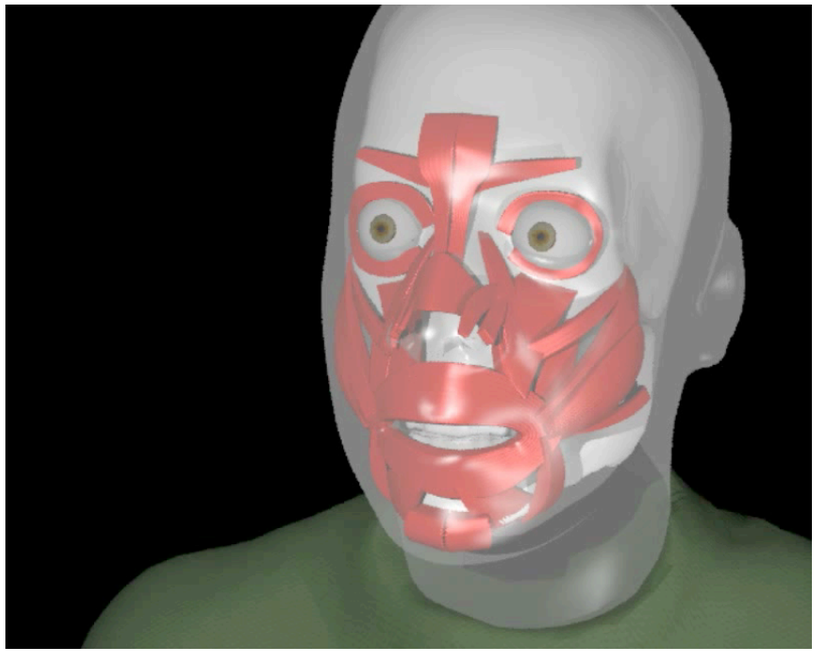
Musculature

Facial musculature control using motion capture



Motion capture

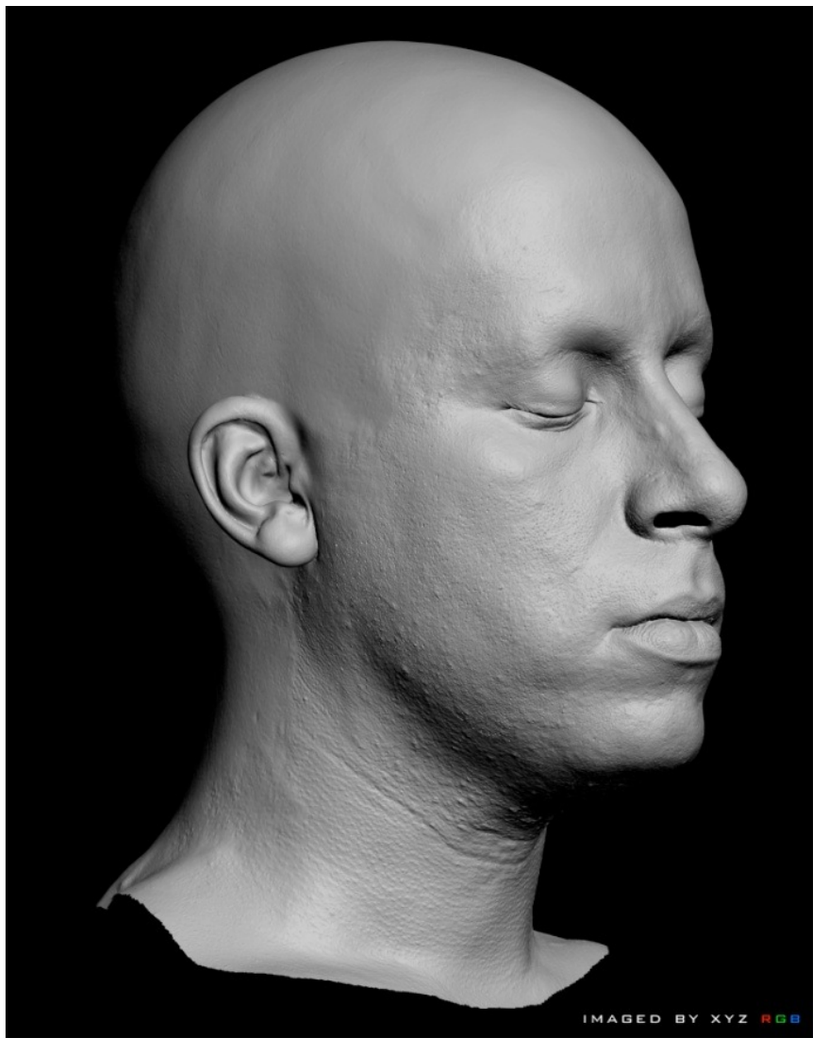


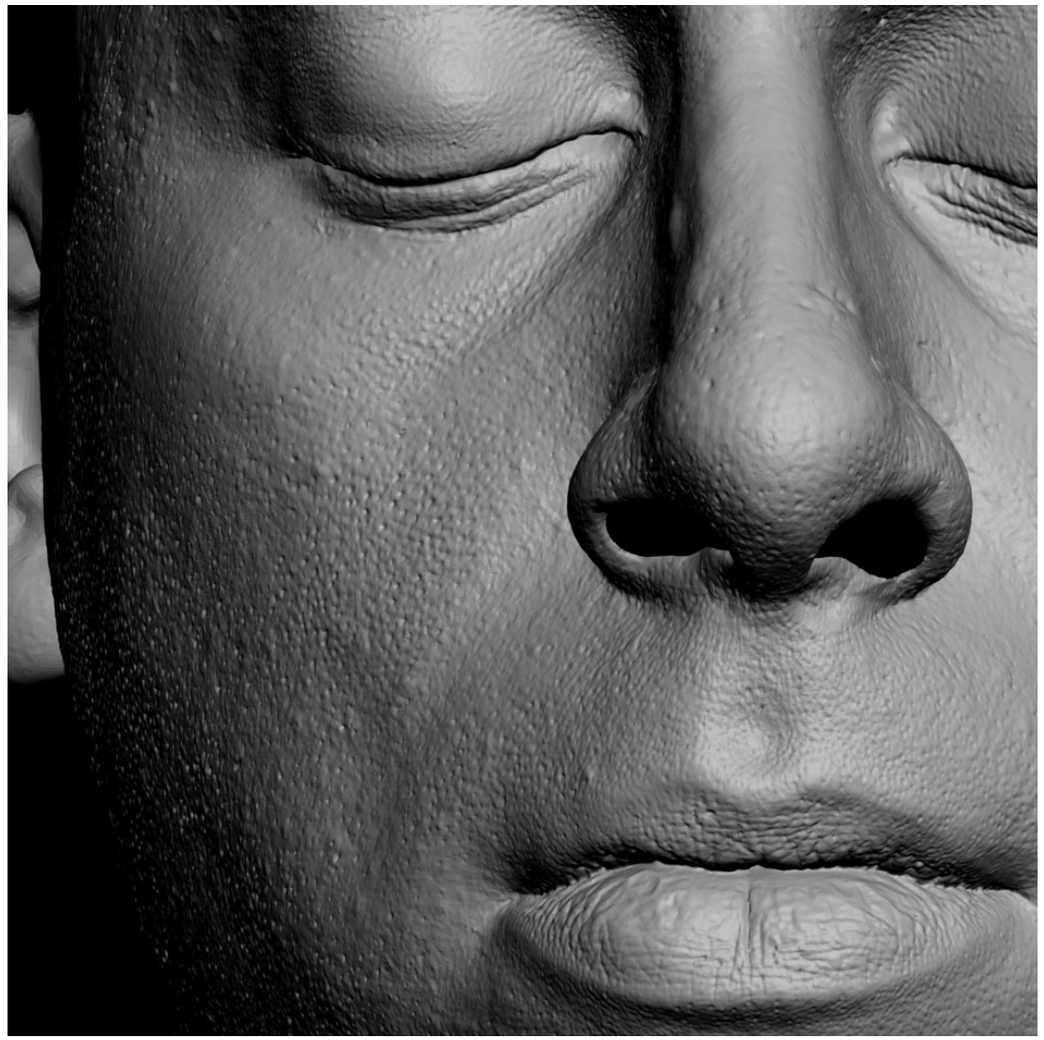


Matching physics based simulation

Speech animation

Speech animation

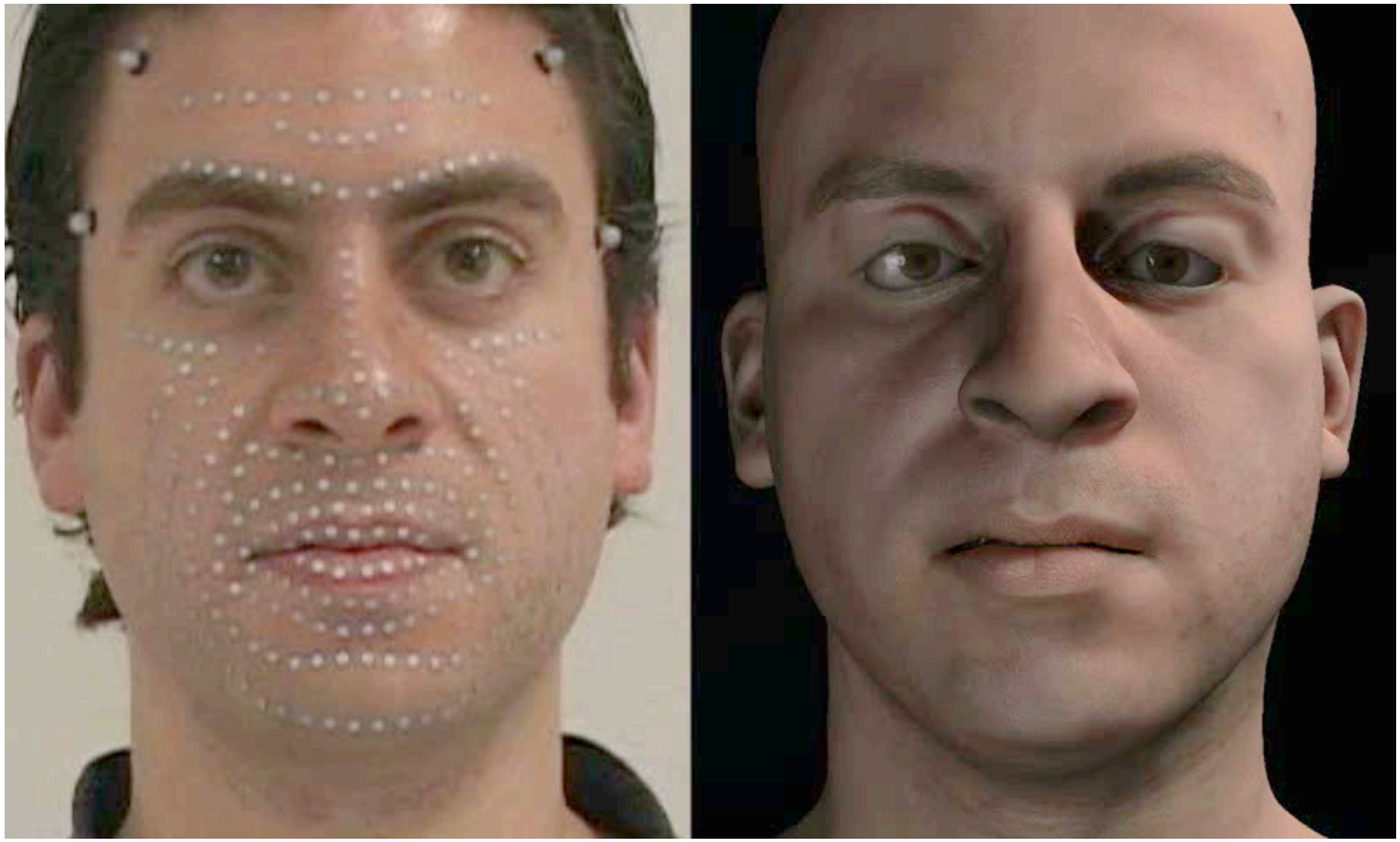




Speech animation

Speech animation

- Analysis of speech samples
  - Motion captured word samples analyzed into muscle activation signals and partitioned into phonemes.

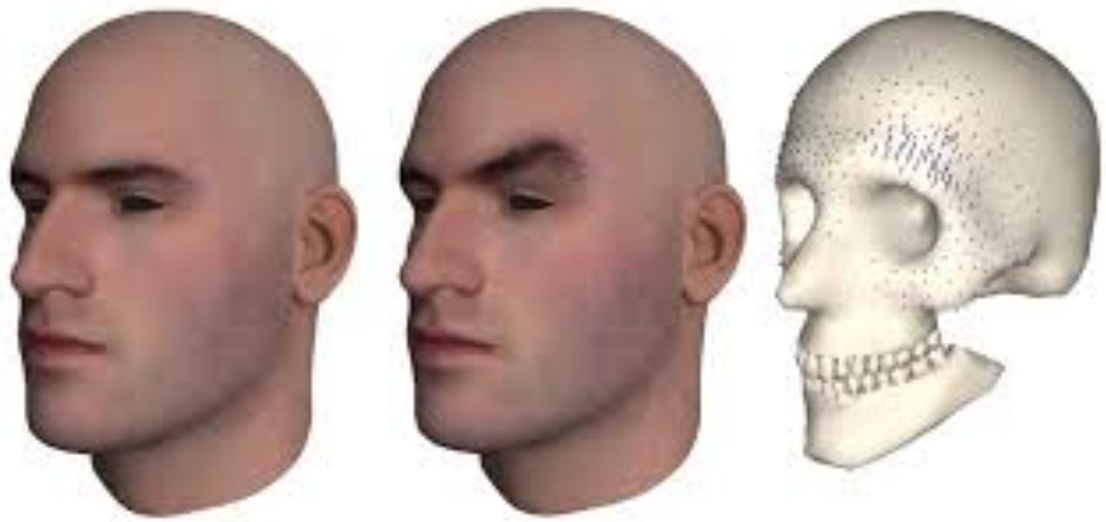


Captured

Synthesized

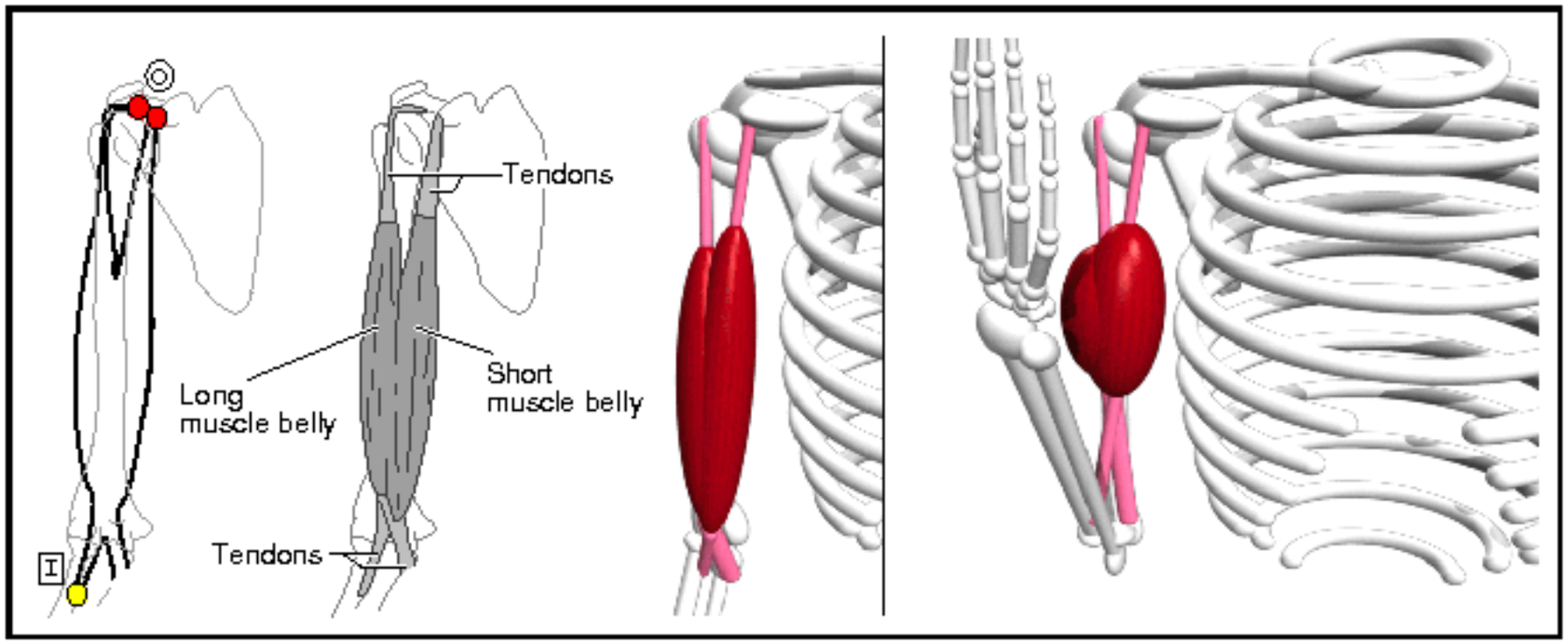
Face Modeling & Simulation

- Cong et al, "Automatic Generation of Anatomical Face Simulation Models" SCA 2015
- Cong et al, "Art-Directed Muscle Simulation for High-End Facial Animation", SCA 2016
- Ichim et al, "Phace: Physics-based Face Modeling and Animation", SIGGRAPH 2017 [YouTube]



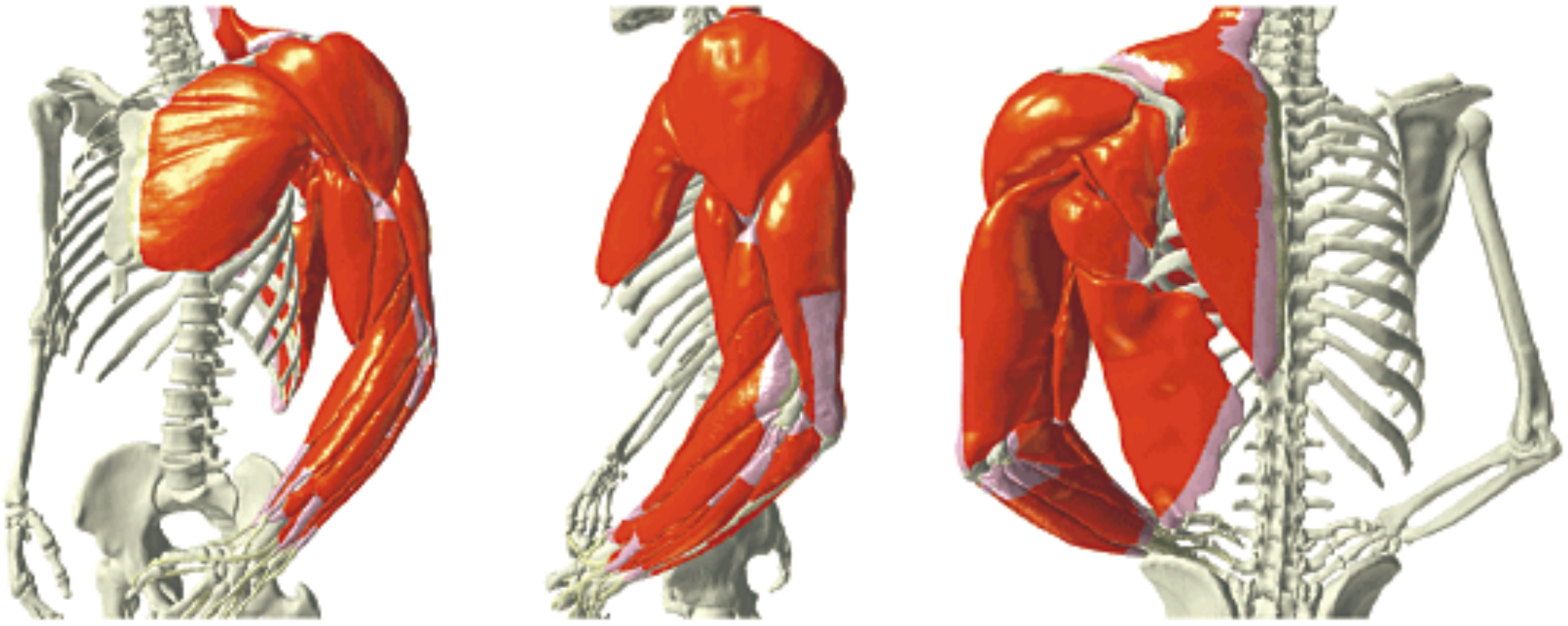
Bodies and Muscles

- Scheepers et al, "Anatomy based modeling of the human musculature" SIGGRAPH'97



Bodies and Muscles

- Teran et al, "Creating and simulating skeletal muscle from the Visible Human Data Set" IEEE TVCG 2005



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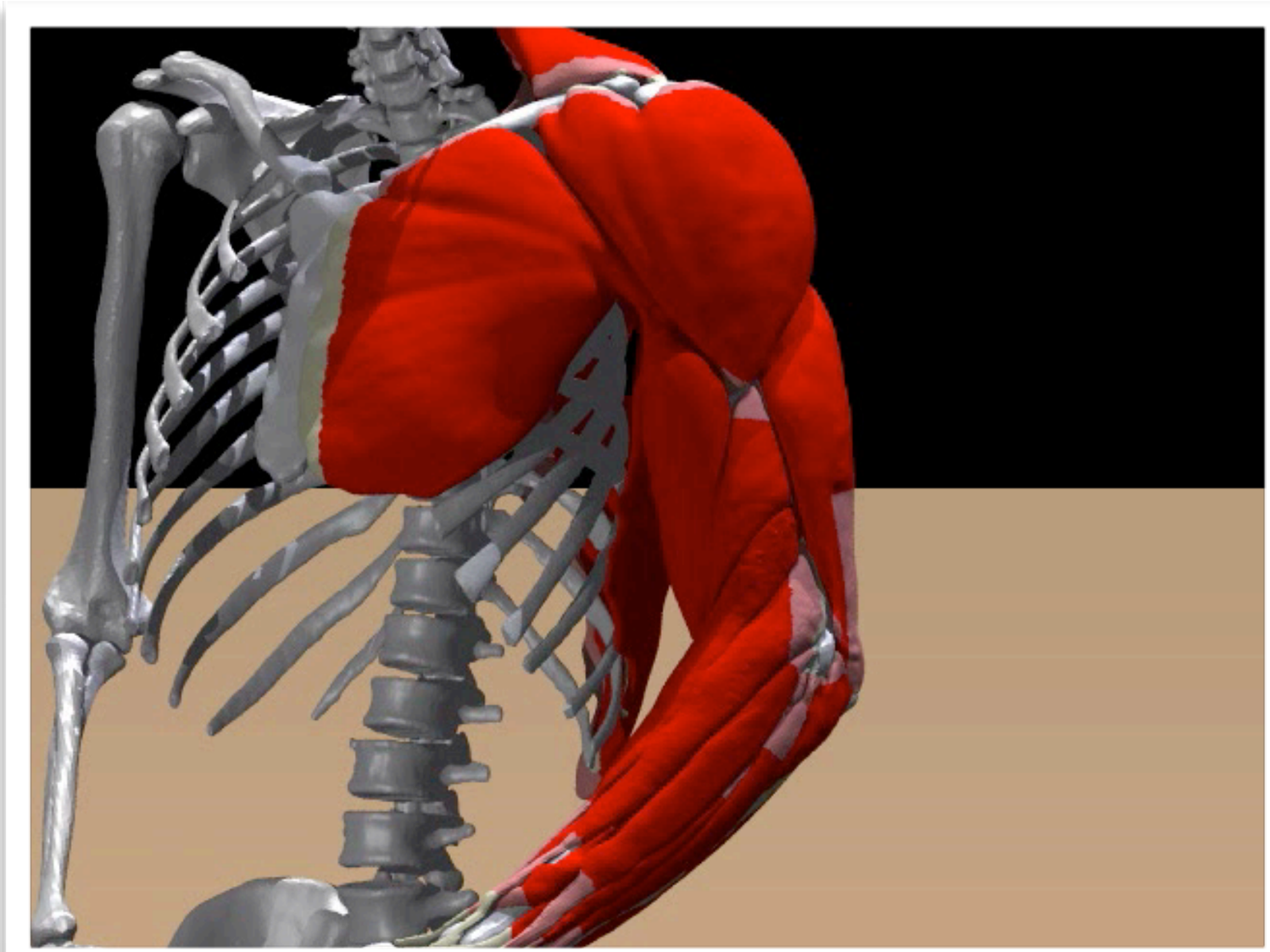
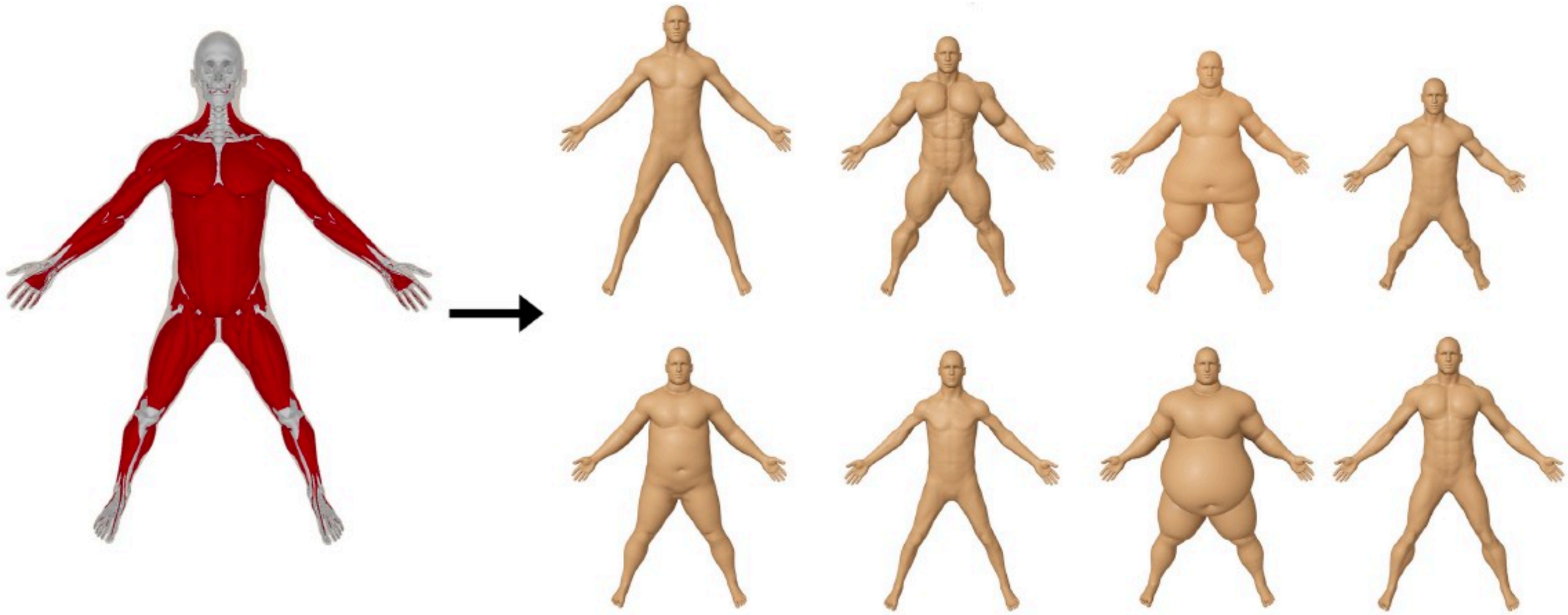


Bodies and Muscles

- Dicko et al, "Anatomy Transfer", SIGGRAPH Asia 2013 [YouTube]
- Saito et al, "Computational Bodybuilding", SIGGRAPH 2015 [YouTube]