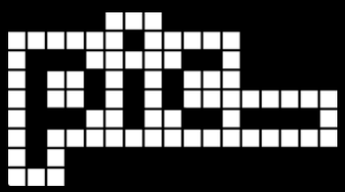
- sample -

3D characters for virtual reality

veronica orvalho catarina runa John P. Lewis



1. Introduction

2. Challenges

3.The animation pipeline

4. A new pipeline

5. The look-a-like avatar

6. 3D characters for virtual reality.

7.“the Virtual Mirror“

8. An industry perspective

POWERED BY

UNREAL TECHNOLOGY

real Pedro

3D Avatar Pedro

main goal:

devise an **Avatar Creation Pipeline**,
easy to use by **non-expert**,
that can produce **look alike** avatars
of a target person, in **less than one hour**.

but,

why it is so

difficult to create

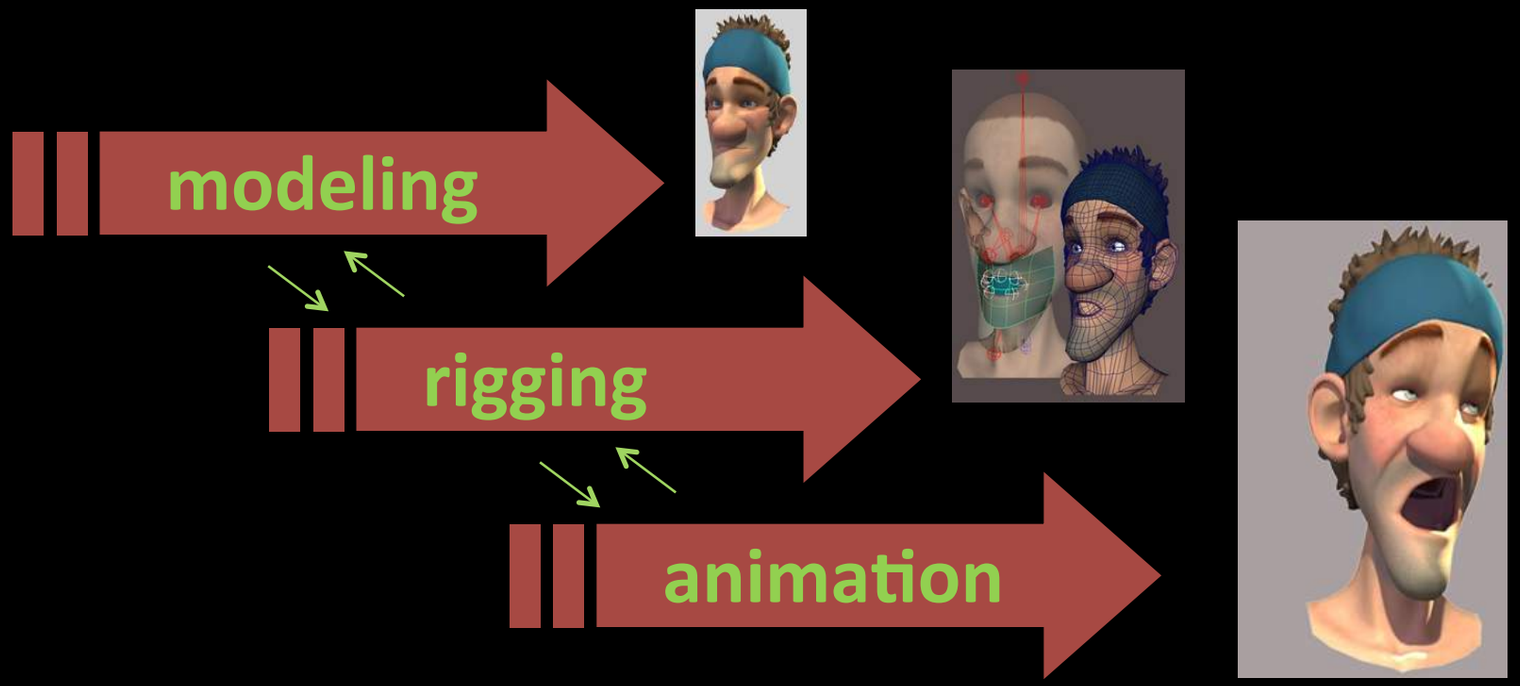
believable

facial animations?

video

animation pipeline

it takes “months” and
expert artists to animate
3D characters using
traditional techniques



software

mixamo

FaceGen

FACEWARE TECHNOLOGIES INC

CRYENGINE® 3

dynamixyz Expressive Machines

DI-O-MATIC

POSER®

id TECH 5

UDK

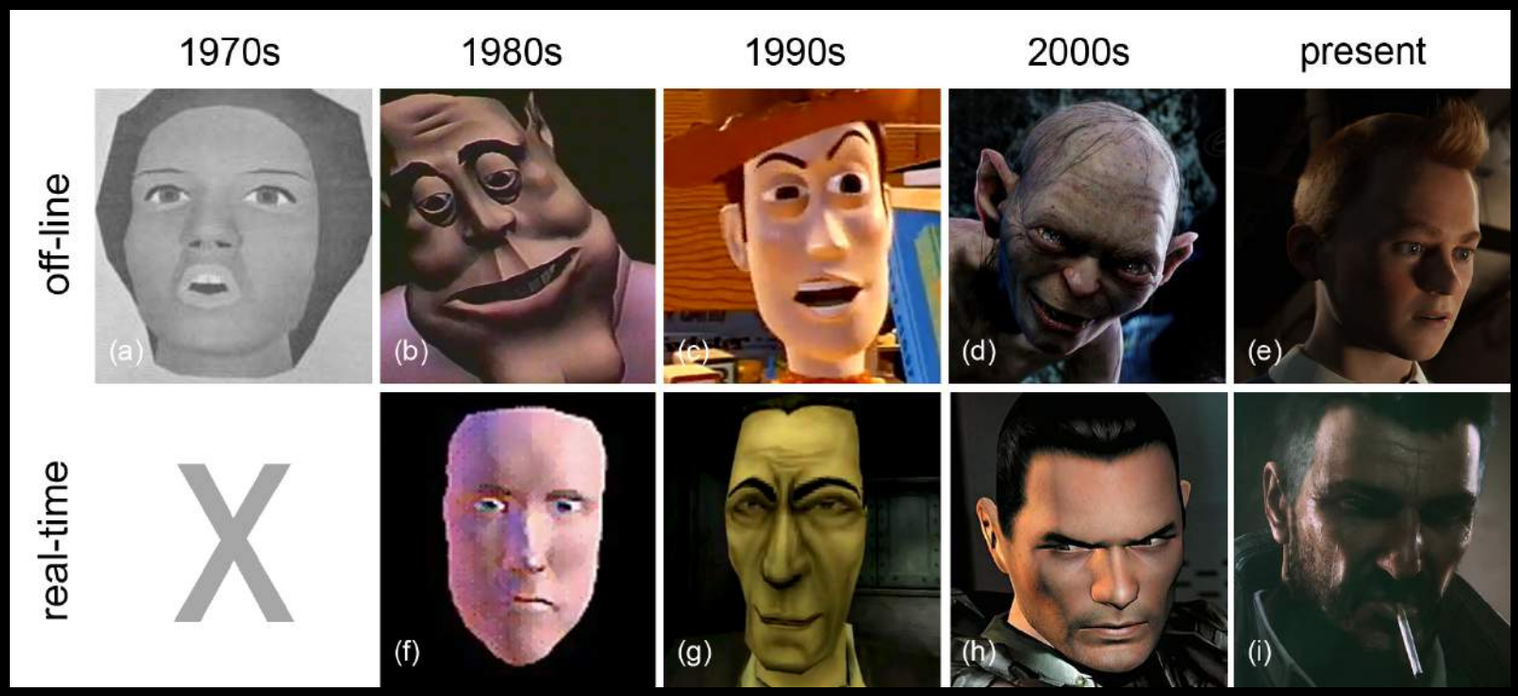
DI4D

faceshift

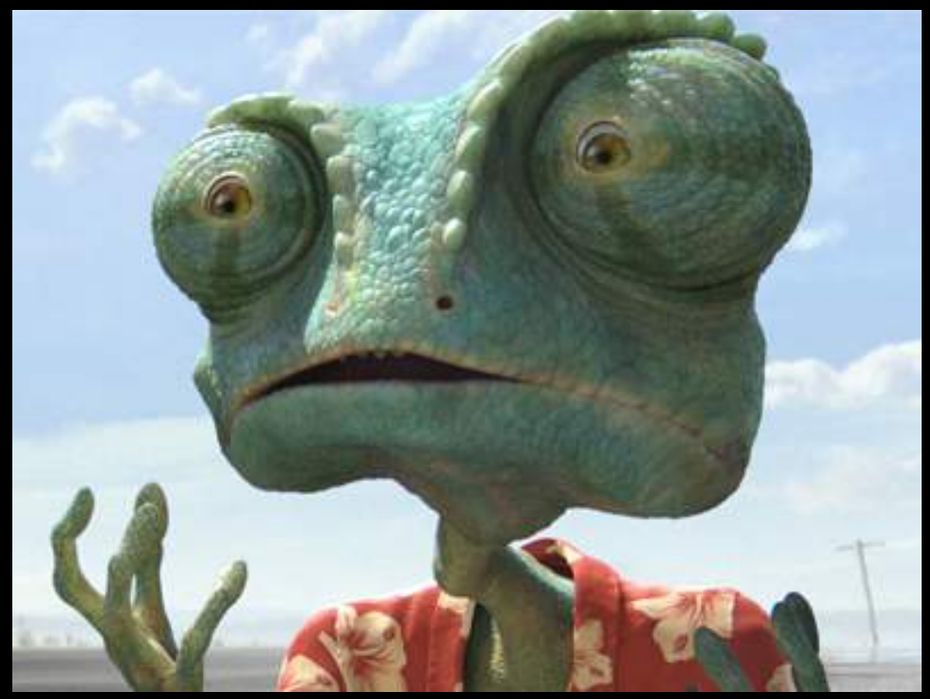
IMAGE METRICS

labor-intensive
time consuming
expert dependent
combine many SW
not user friendly

briefly in the past



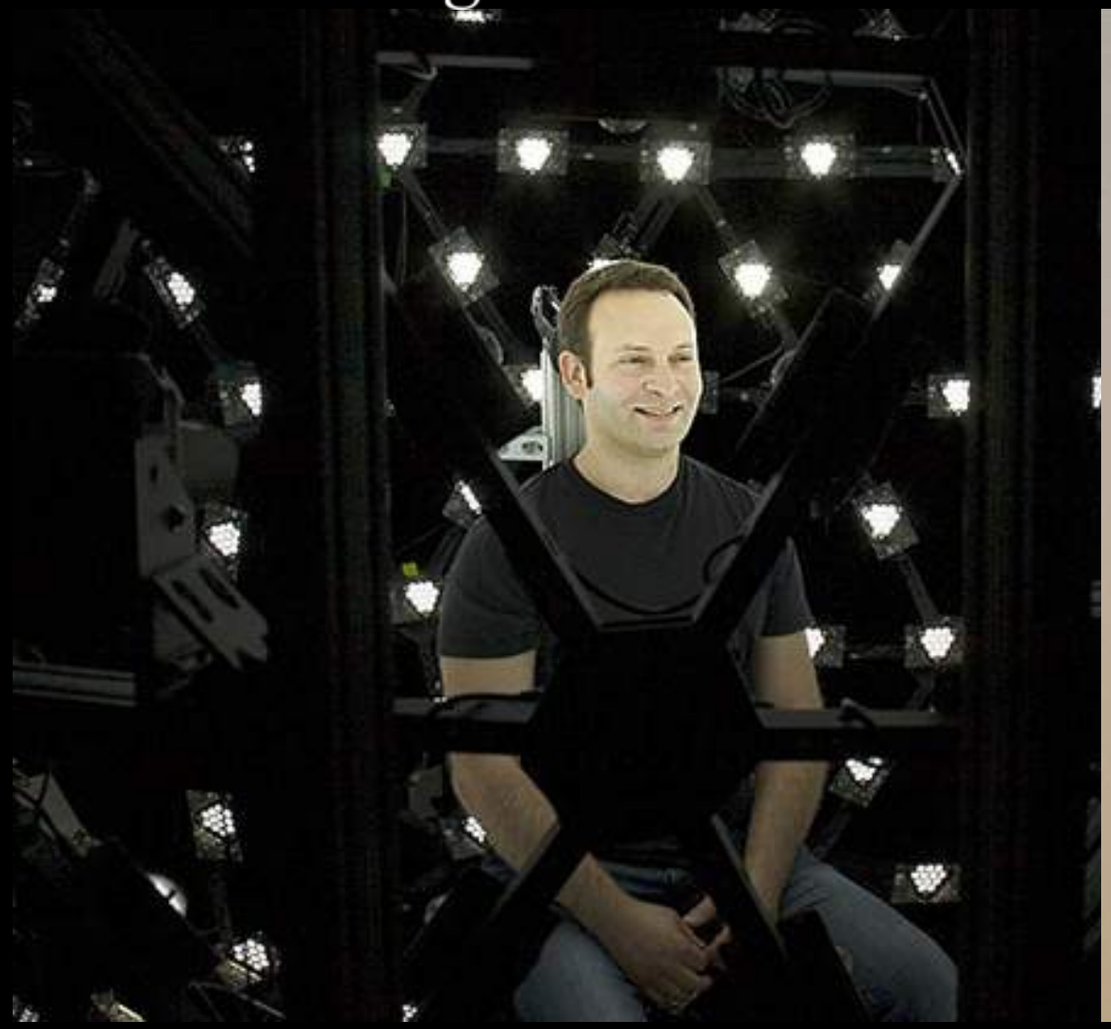
a) Animated parametric face model (Parke 1972); b) Tony de Peltrie (Bergeron and Lachapelle 1985); c) Toy Story I 1996; d) Gollum, LOTR 2004; f) 1st Virtual Puppet (Degraf 1988); g) Half Life 1998; h) Doom 3 2004; i) The Samarian Demo 2011; e) Tin Tin 2011. [Orvalho et. al .2012]

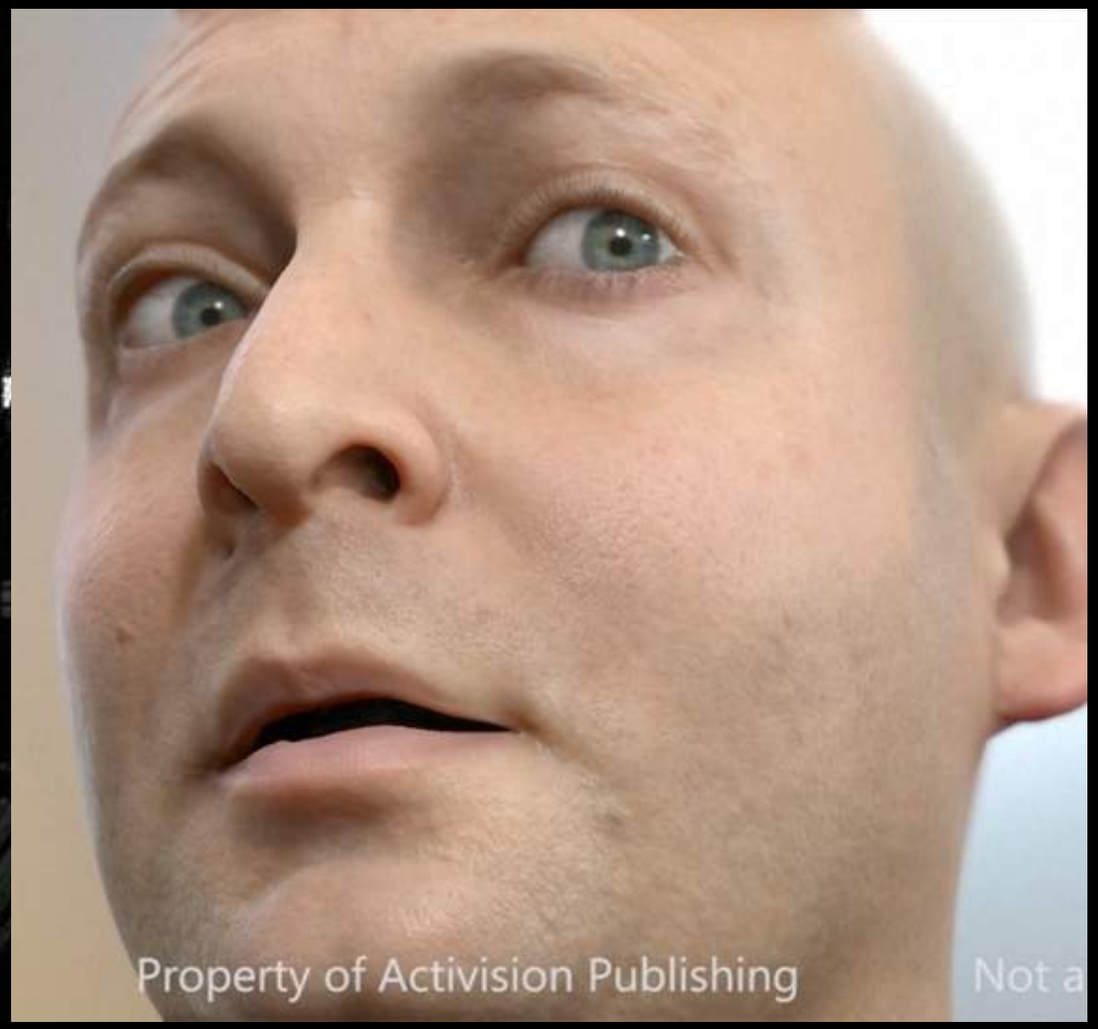


Rango 2011

state of the art

USC Institute for Creative Technologies





Javier von der Pahlen *et al,* Digital ira and beyond: creating real-time photoreal digital actors.
In *ACM SIGGRAPH 2014 Courses* (SIGGRAPH '14). ACM, New York, NY, USA, , Article 1 , 384 pages.

how we got started?

back to the basics

1. we see **faces** all the time, **everywhere**
2. faces play a **key** role in **human communication**
3. we detect any **unnatural movement**
4. **huge diversity**: age, gender, ethnicity…
5. **wide range** of possible characters

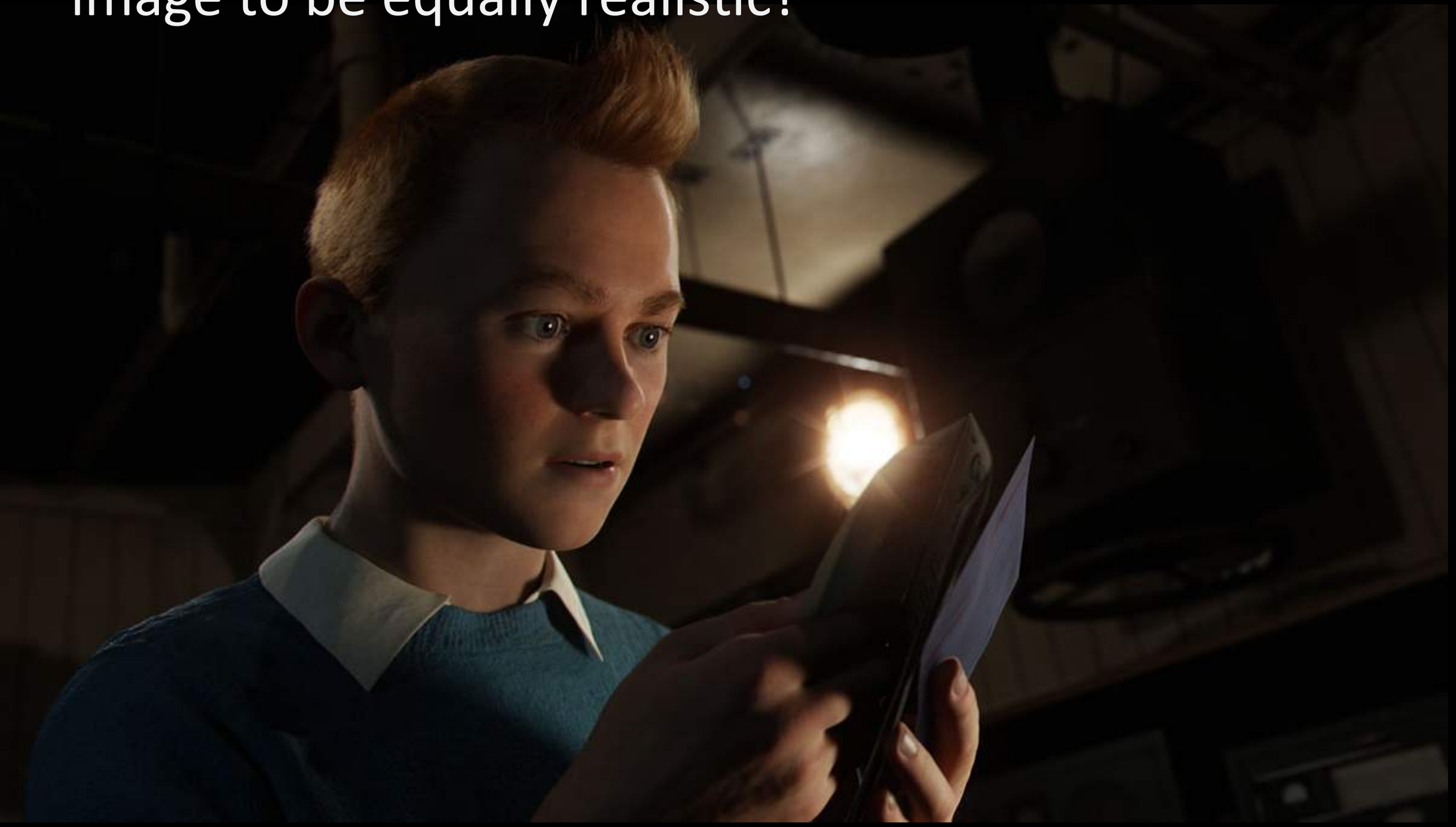
photorealistic or not?

1: are the current virtual clones really “photoreal”?

Tron Legacy,2010

[Lewis 2006]

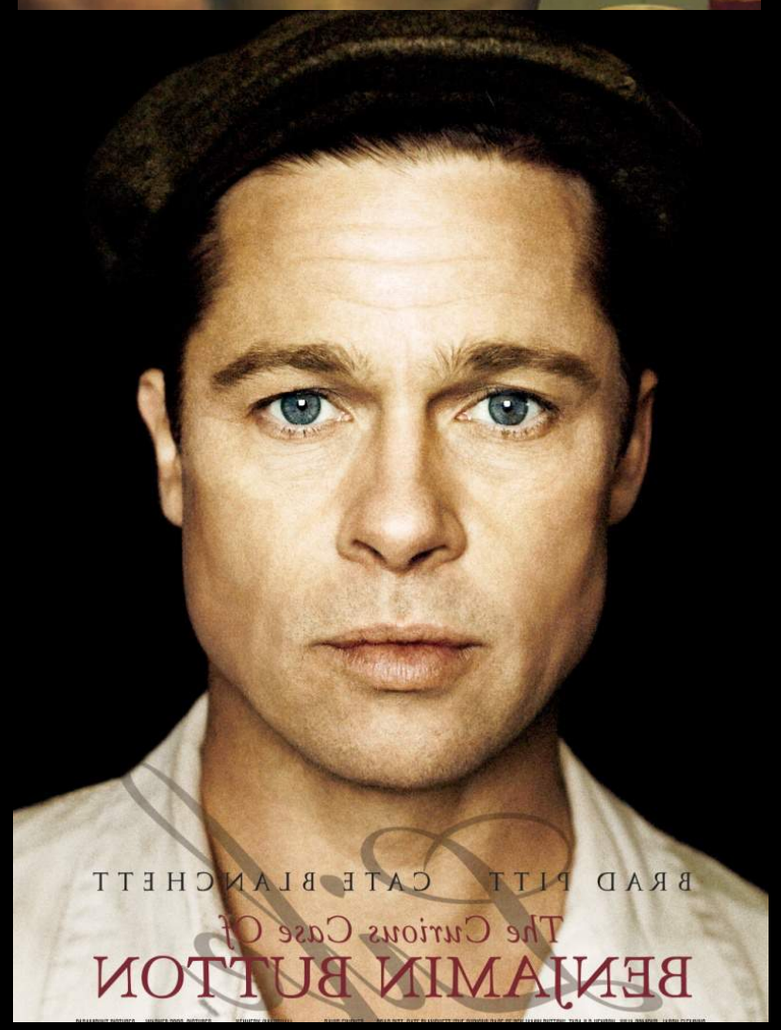
2: does everyone perceive an image to be equally realistic?



Tin Tin 2011

[Lewis 2006]

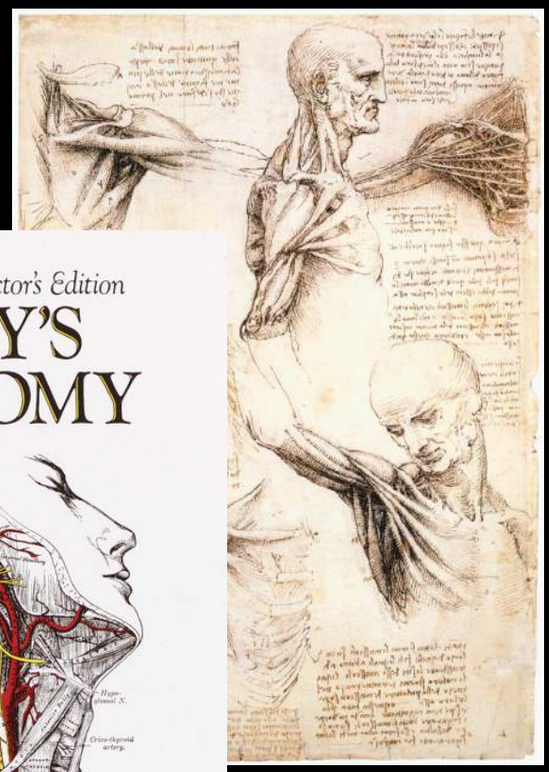
3: changing gender, age, features alter our perception and understanding of realism?

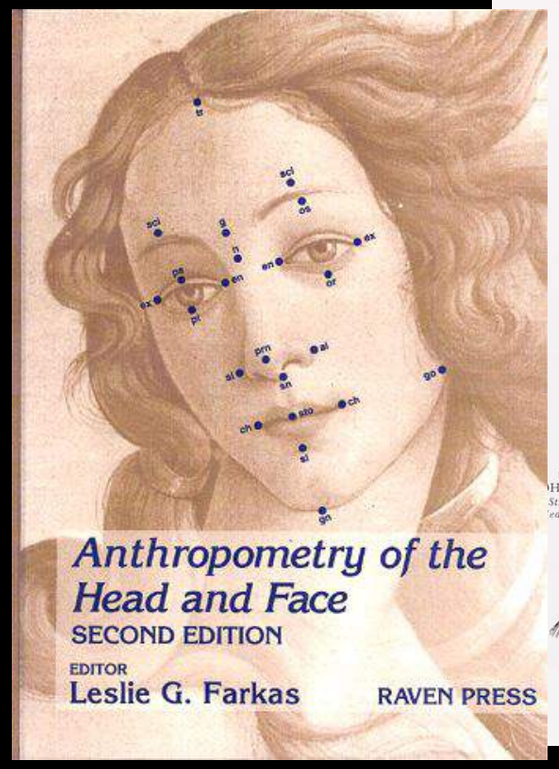


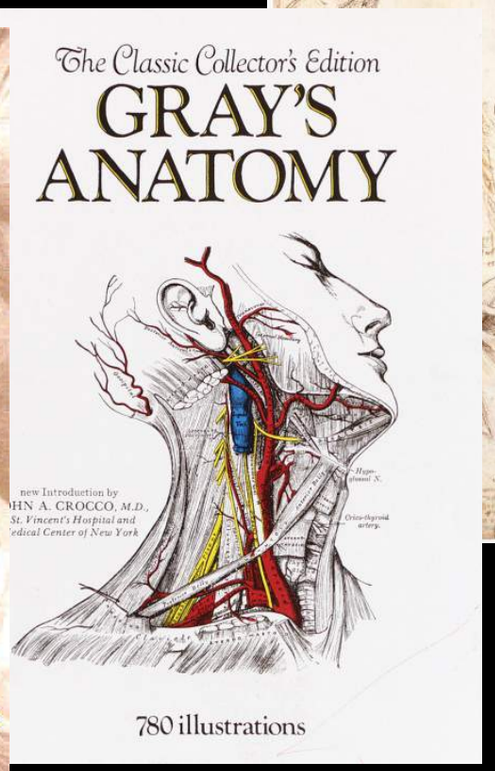
understand the facial **morphology** and **behaviour**

behaviour + **morphologies: challenges**

- anatomical diversity

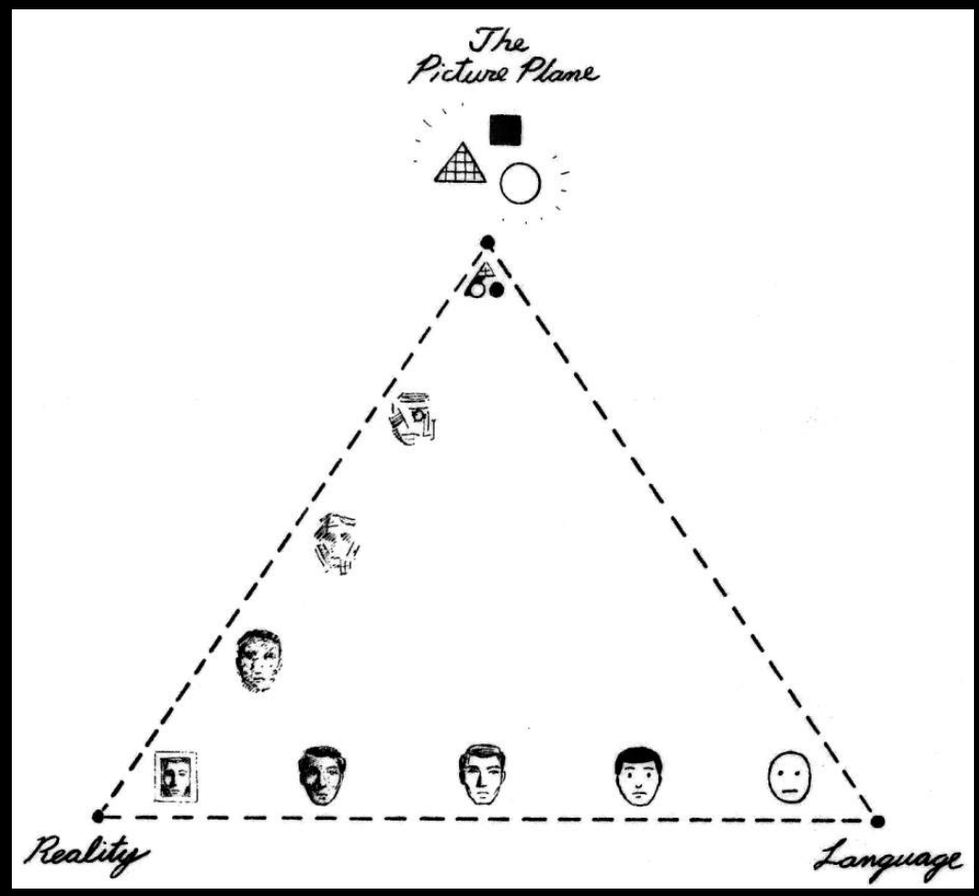






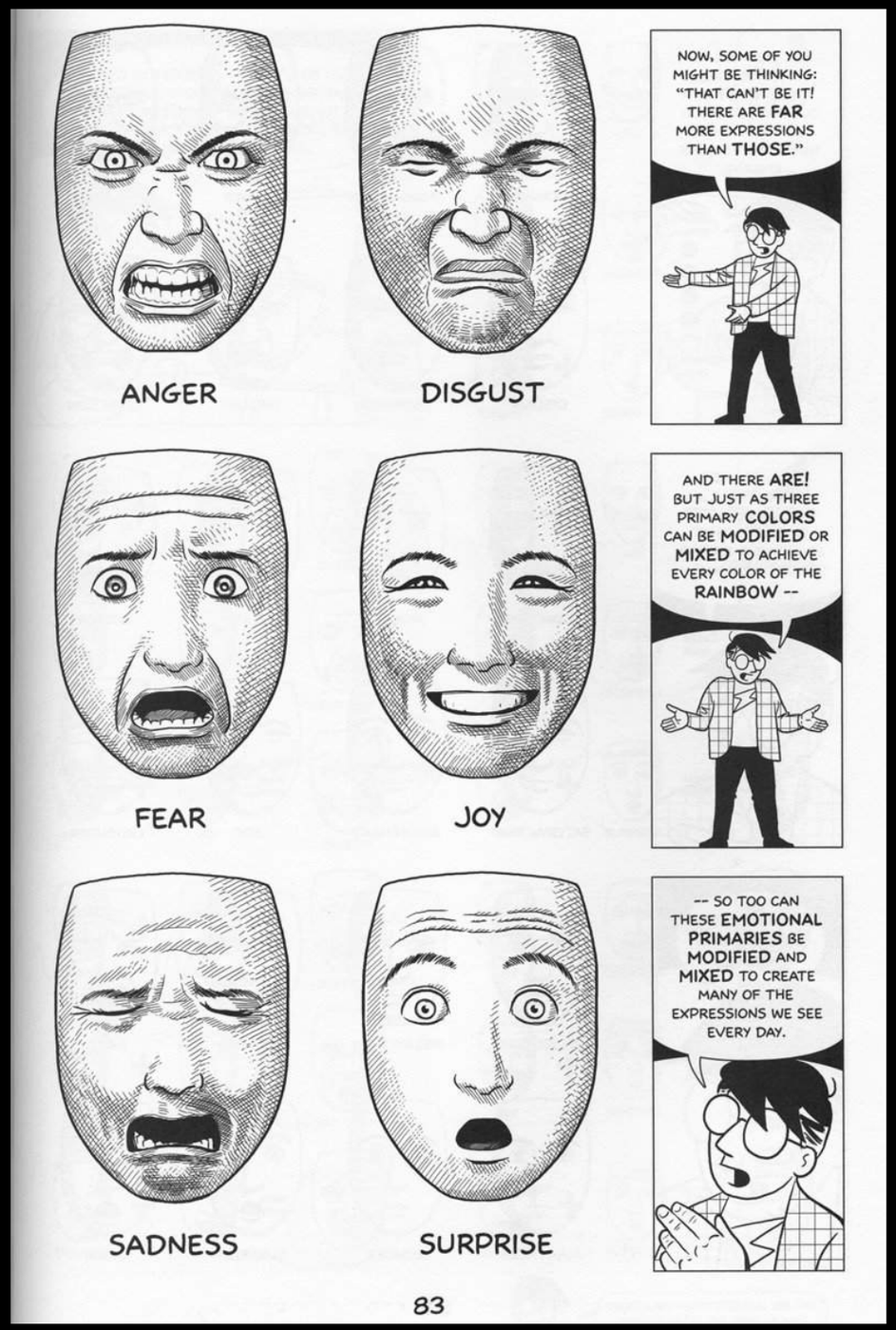
behaviour + morphologies: **challenges**

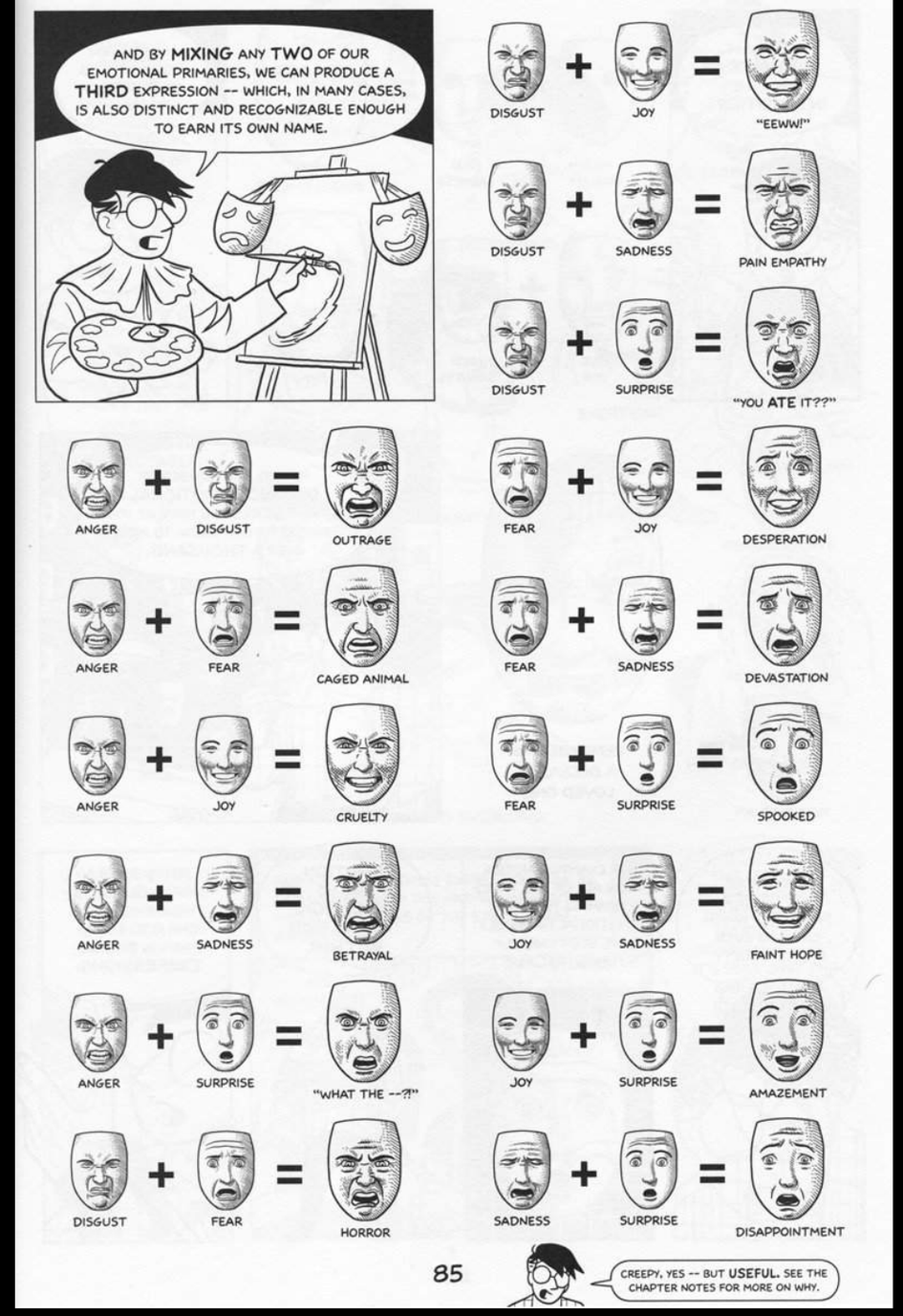
- anatomical diversity
- variety of the visual styles



no formal classification

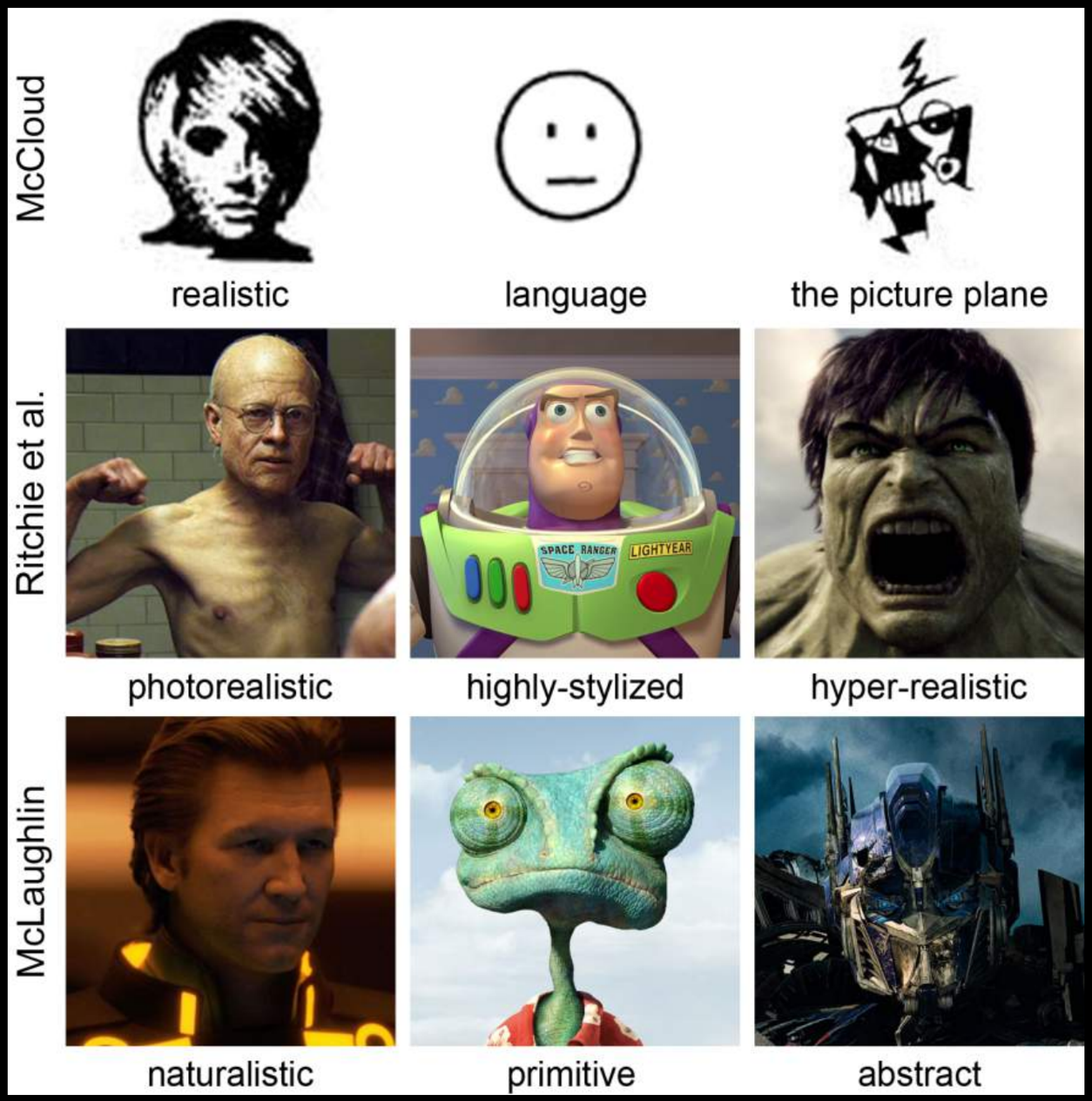
Understanding Comics [McCloud 1993]





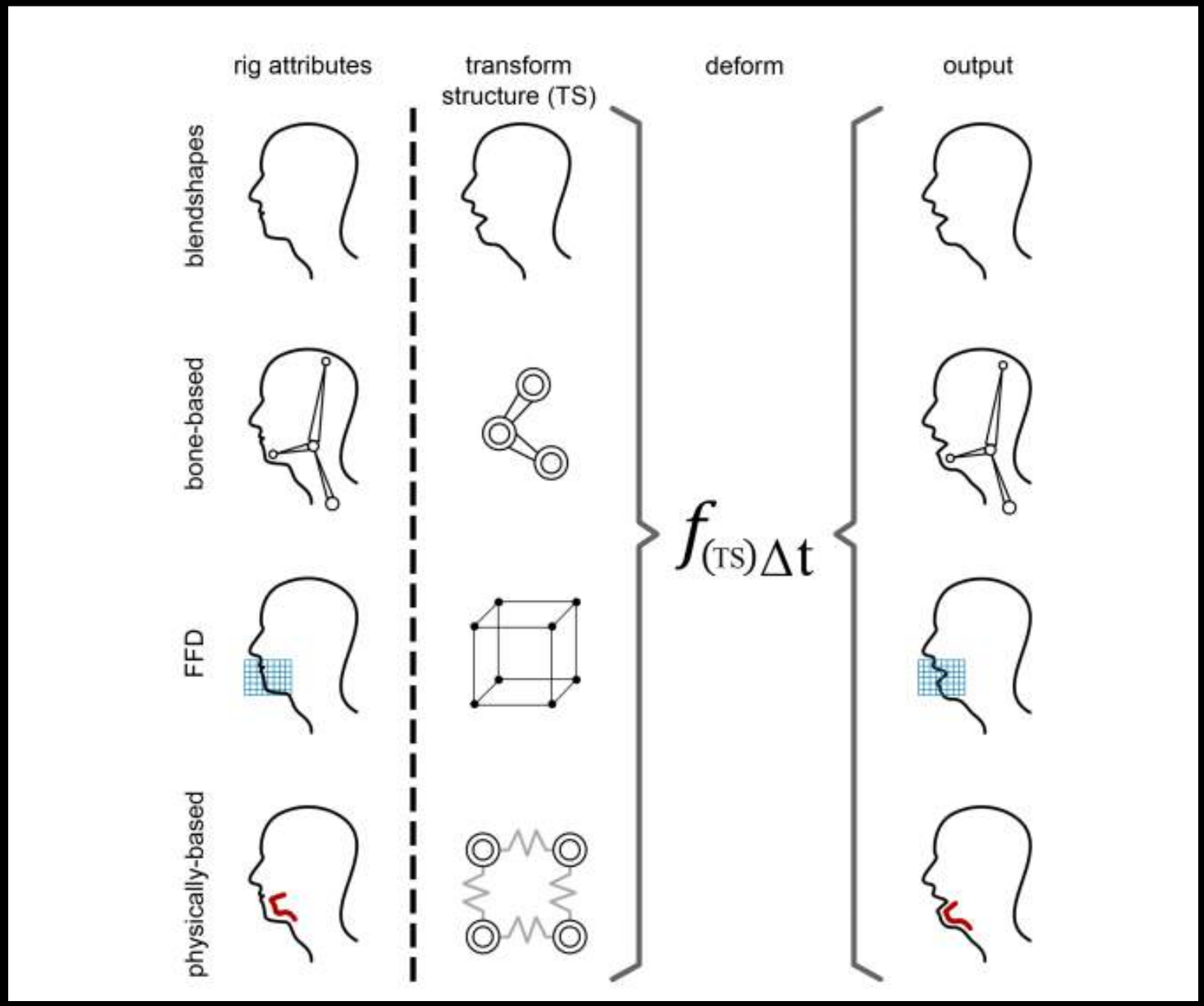
From Scott McLoud book: Understanding Comics (1993)
Basic expressions defined by Ekman (1978)

visual style



behaviour + morphologies: **challenges**

algorithms for transformation and deformation

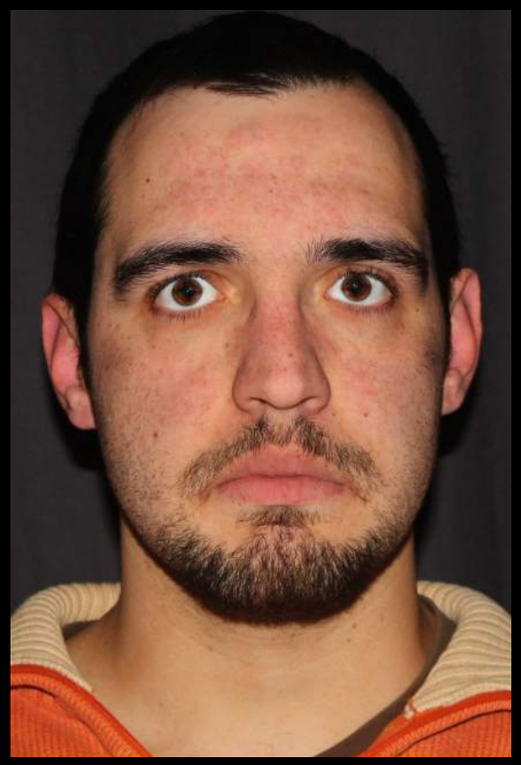


the look-a-like avatar

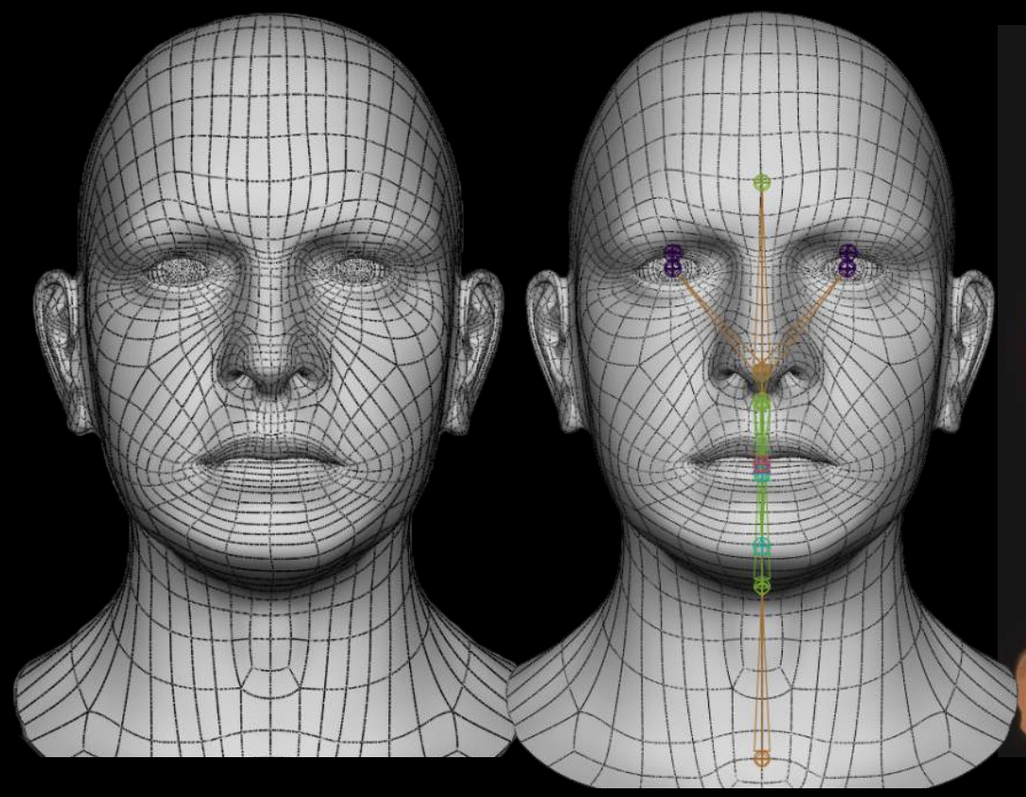
step by step

video

look-a-like avatar: 5 steps



1. capture



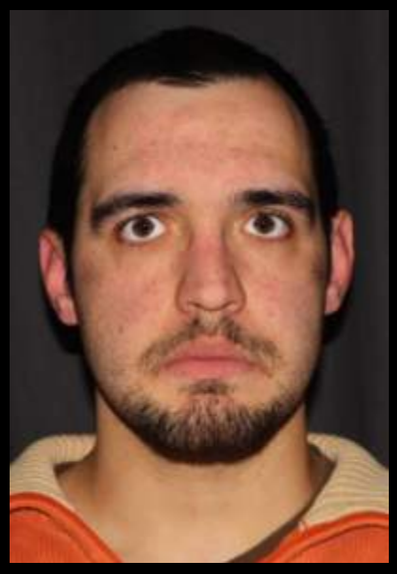
2. reconstruct

3. rig

4. texture

5. display

evolution



Evolution

2012

2013

January 2014

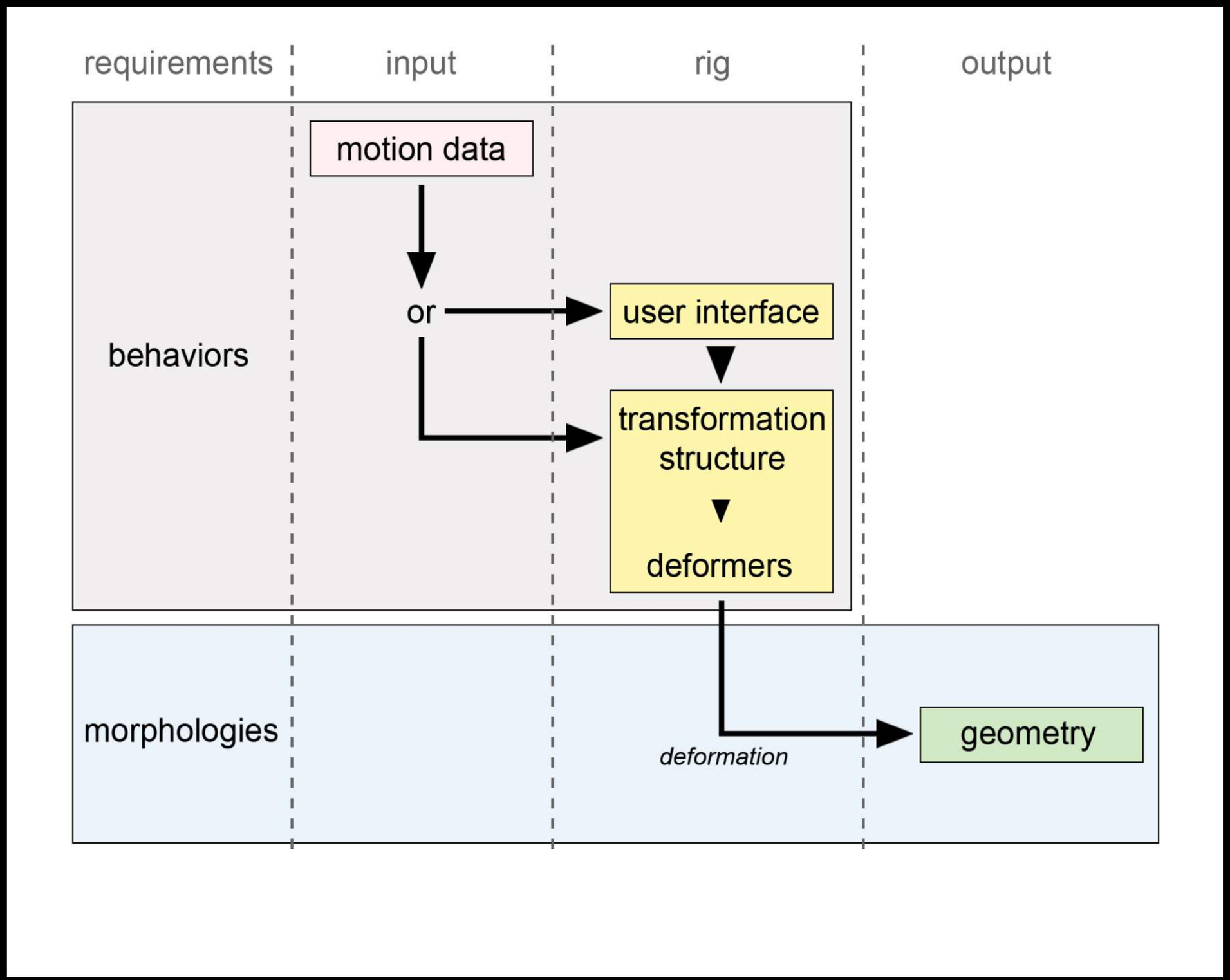
July 2014

now

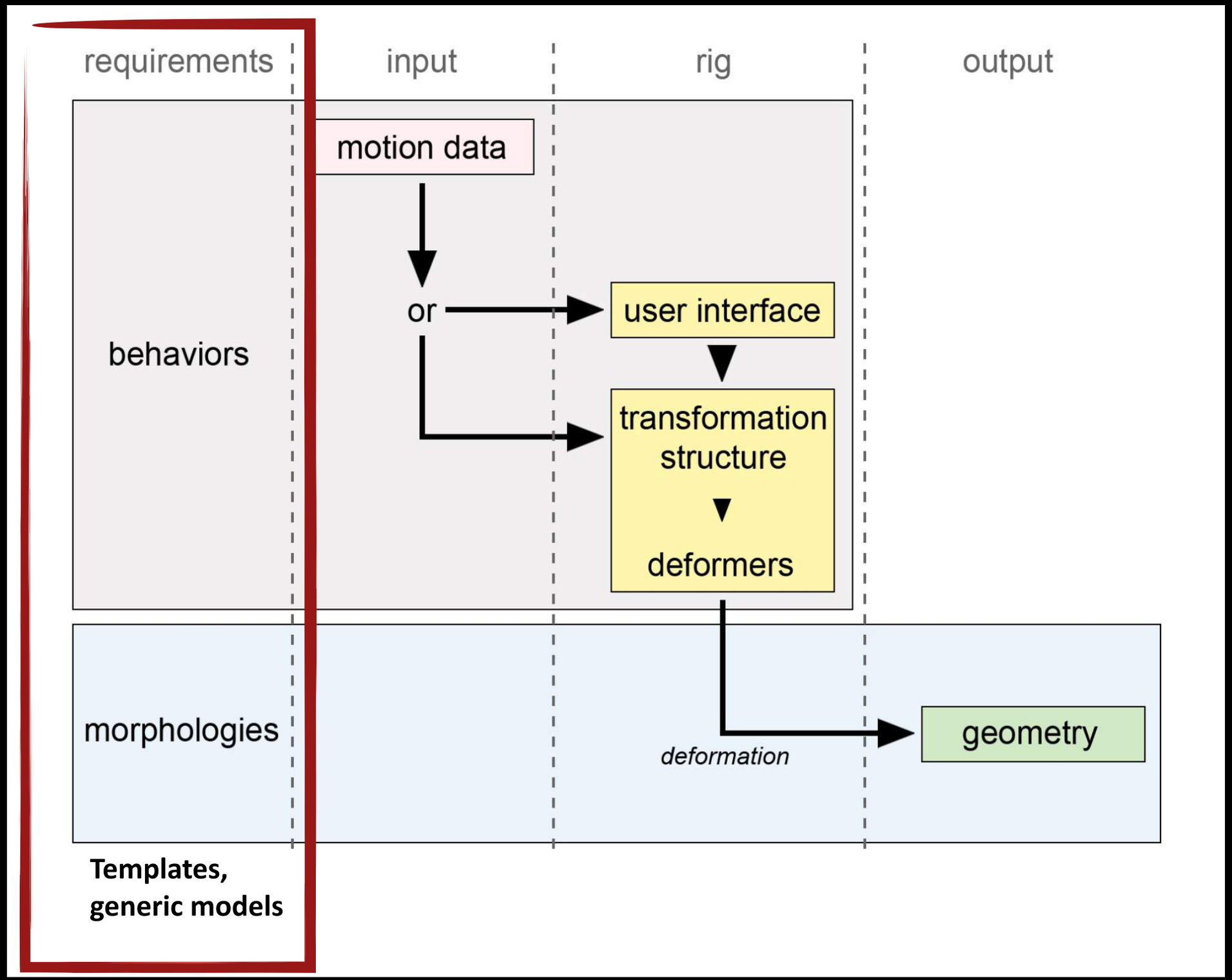
what we have now:

Automatic virtual avatar creation: modelling, rigging and markerless motion capture and physically based render

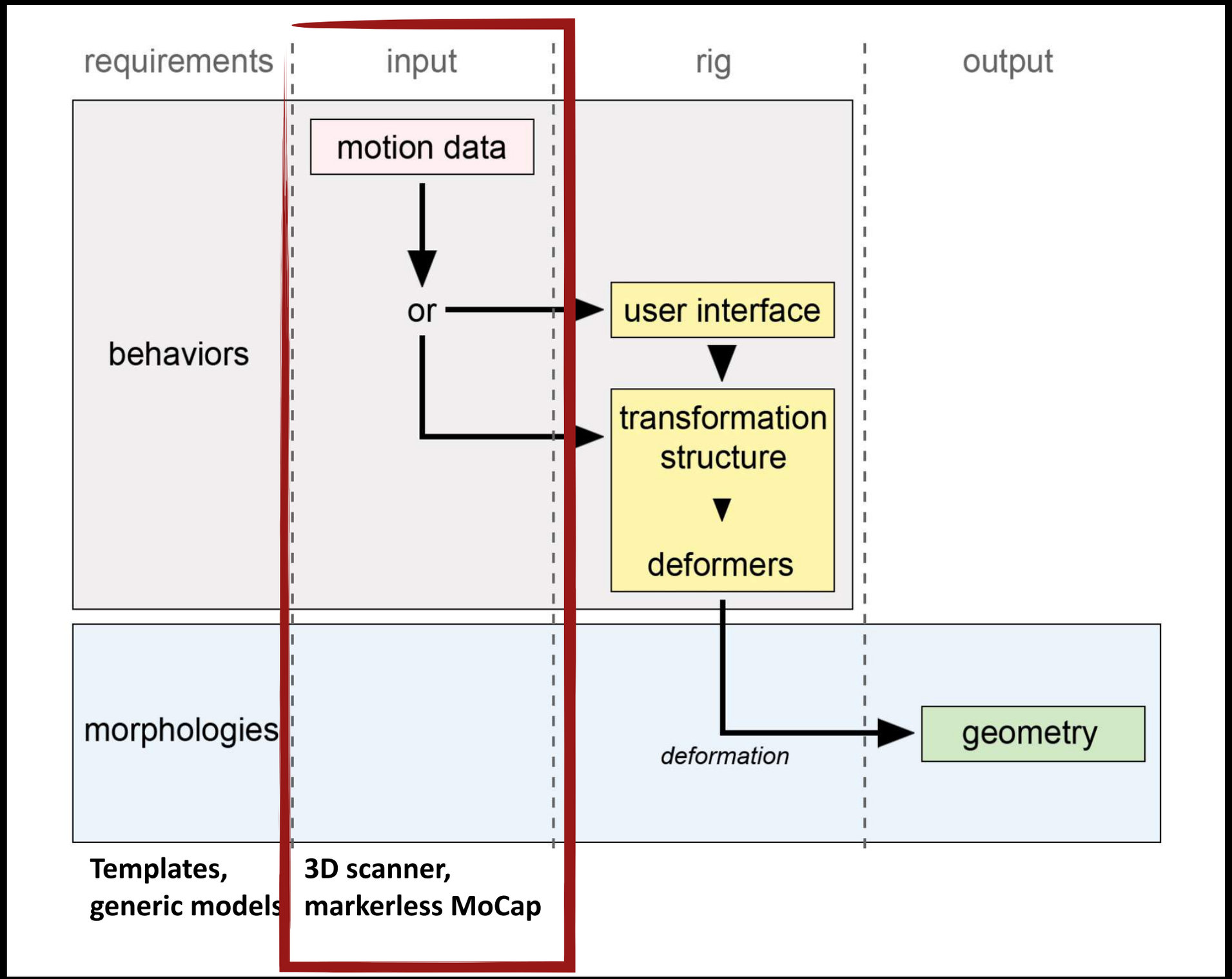
pipeline


requirements
input
rig
output
behaviors
motion data
or
user interface
transformation structure
deformers
morphologies
deformation
geometry

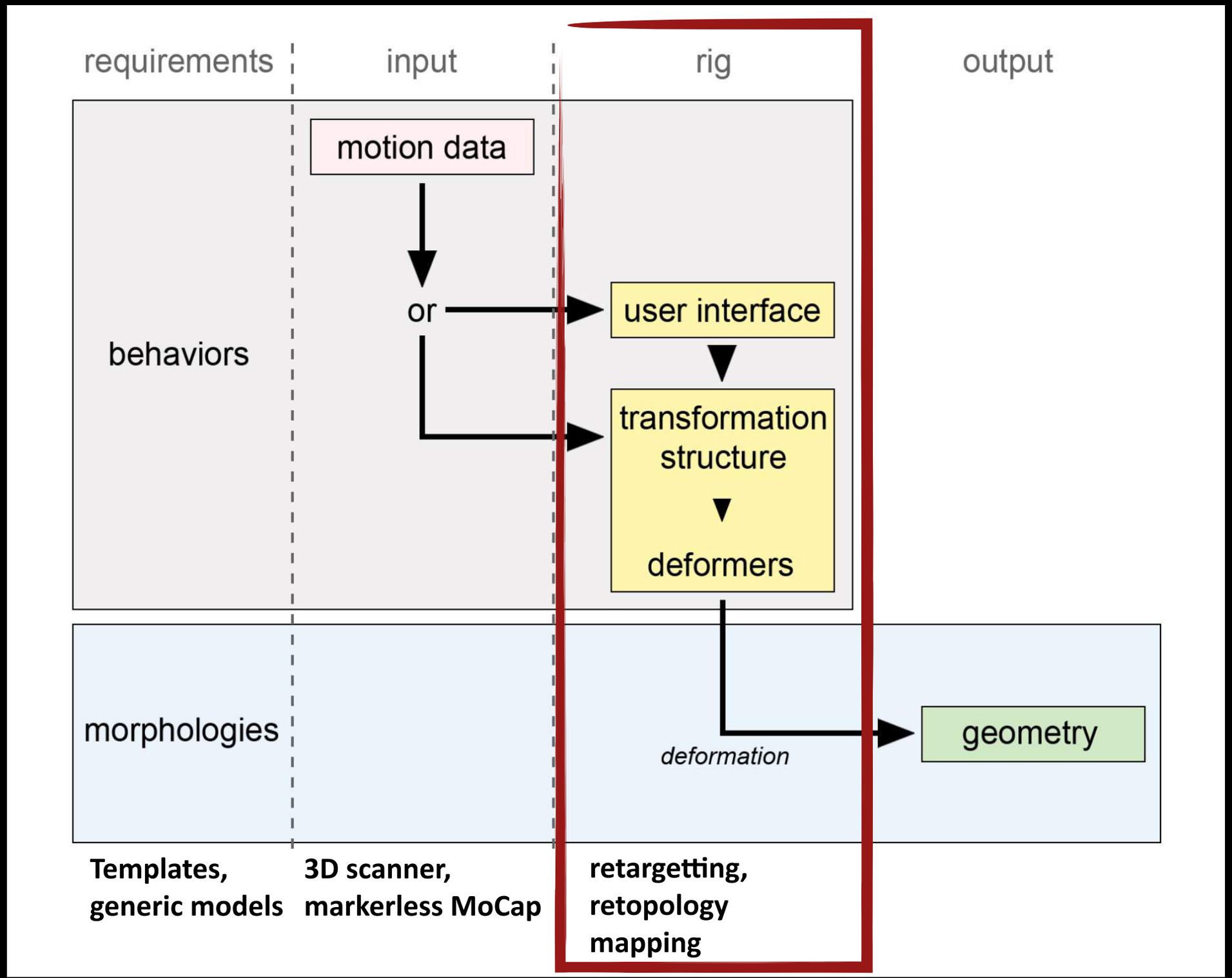
pipeline


requirements
input
rig
output
behaviors
motion data
or
user interface
transformation structure
deformers
morphologies
deformation
geometry
Templates, generic models

pipeline


requirements
input
rig
output
motion data
or
user interface
transformation structure
deformers
behaviors
morphologies
deformation
geometry
Templates, generic models
3D scanner, markerless MoCap

pipeline


requirements
input
rig
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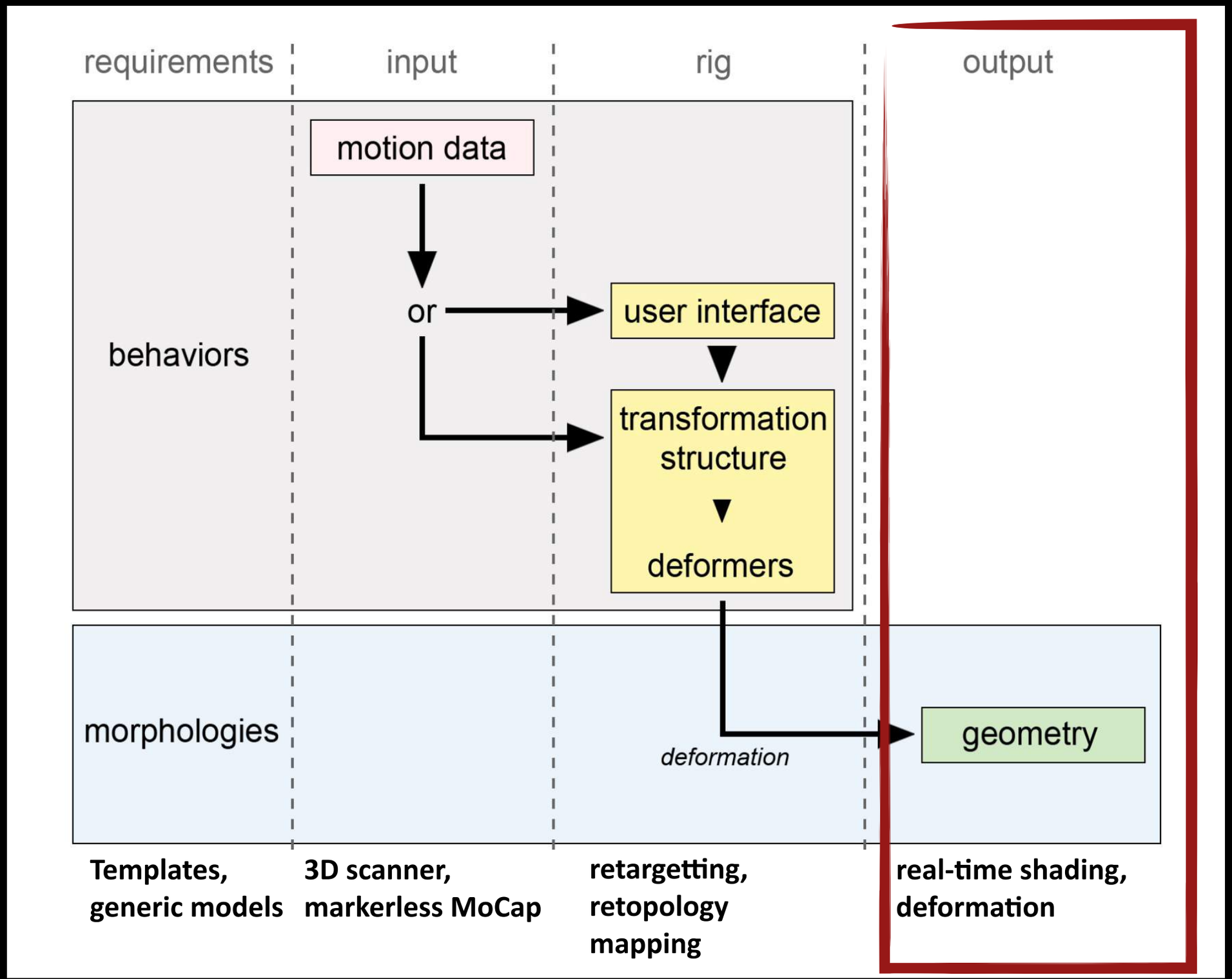
motion data
or
user interface
behaviors
transformation structure
deformers
morphologies
deformation
geometry
Templates, generic models
3D scanner, markerless MoCap
retargetting, retopology mapping

pipeline

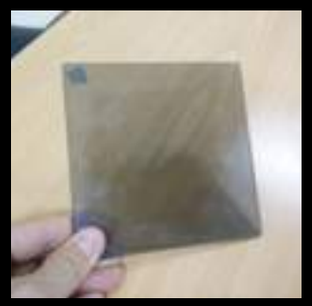

requirements
input
rig
output
motion data
behaviors
or
user interface
transformation
structure
deformers
morphologies
deformation
geometry
Templates,
generic models
3D scanner,
markerless MoCap
retargetting,
retopology
mapping
real-time shading,
deformation

pipeline architecture here

acquisition

input

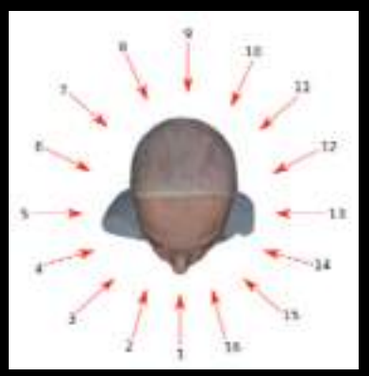
output

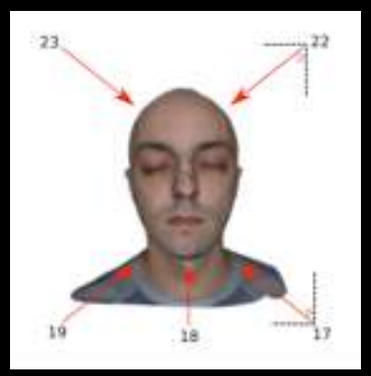


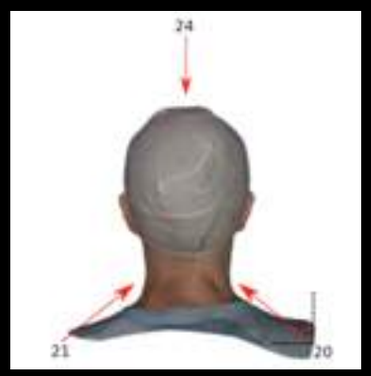
reconstruction

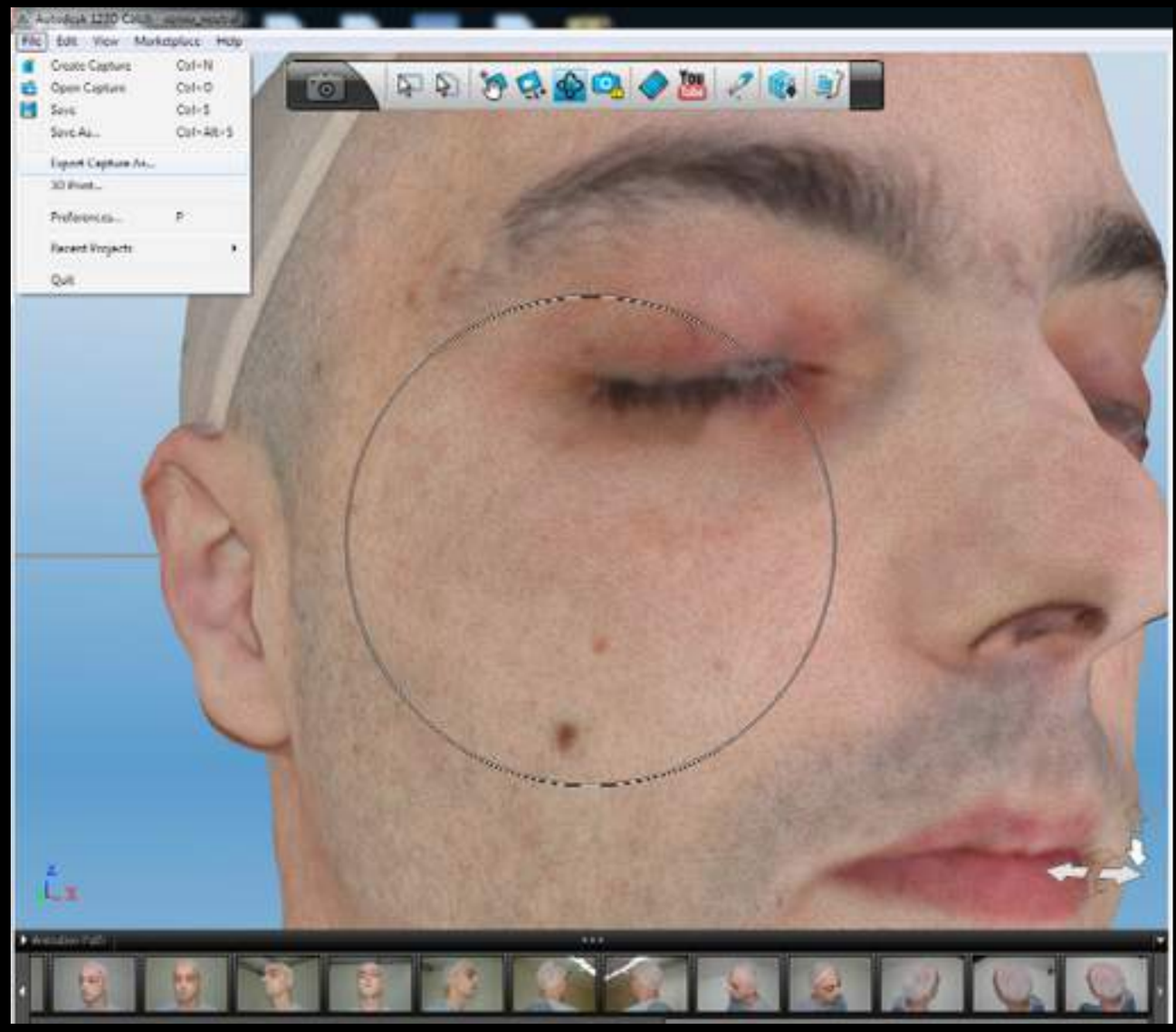
input

output









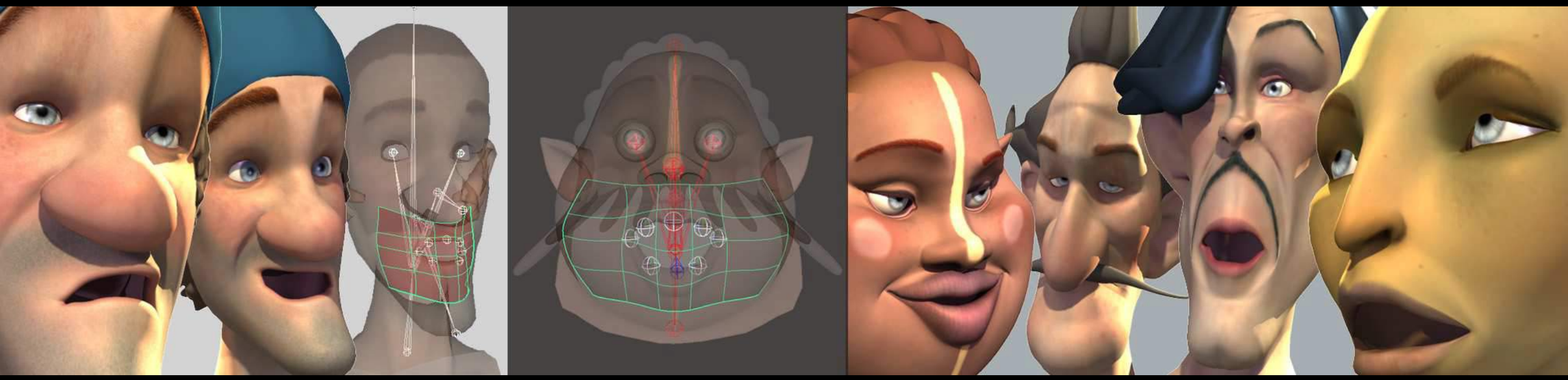
raw geometry

processed geometry

raw mesh

processed mesh

retopology: rig transfer



Source

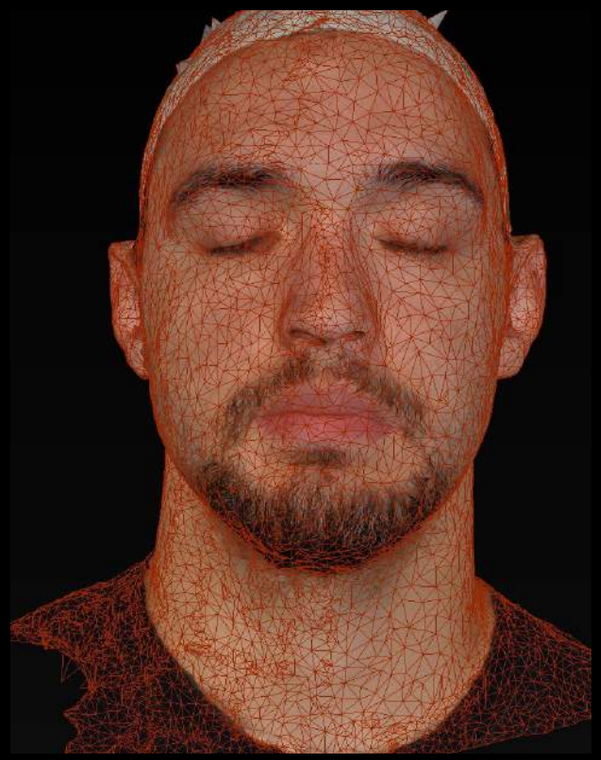
Targets

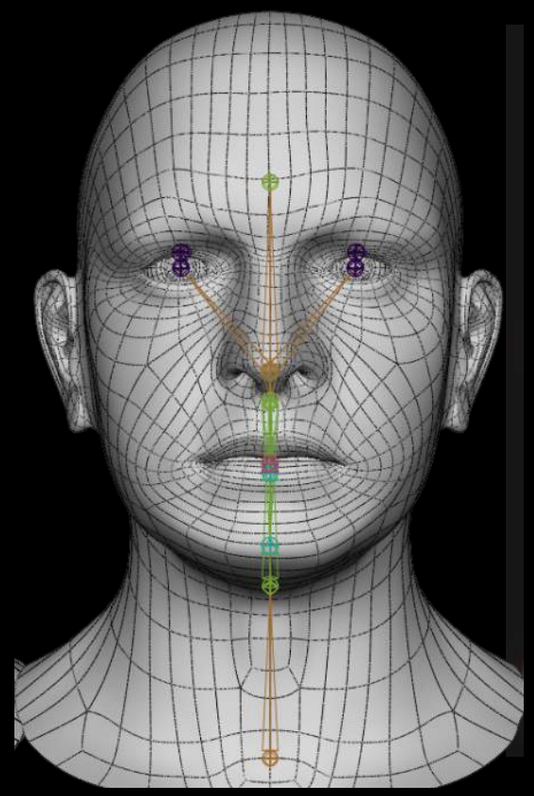
video

texture wrapping

input

output





scan mesh to UV space mesh

shading

retopology

albedo texture
cross polaraized

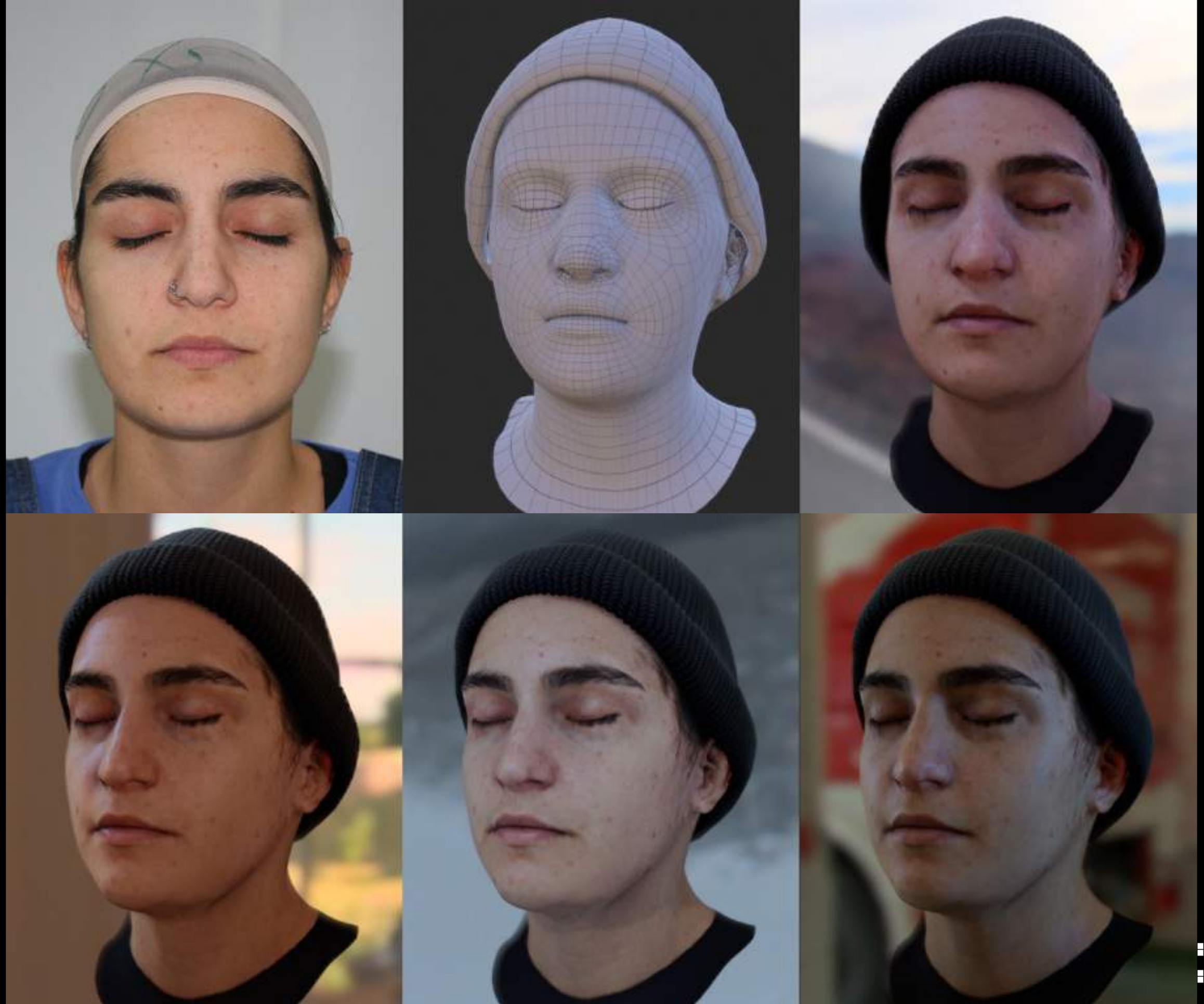
dissplacement &
normal map

skin subsurface diffuse

specular from albedo

Transmission light
from geometry

Physically Based Render
Image Based LIghting



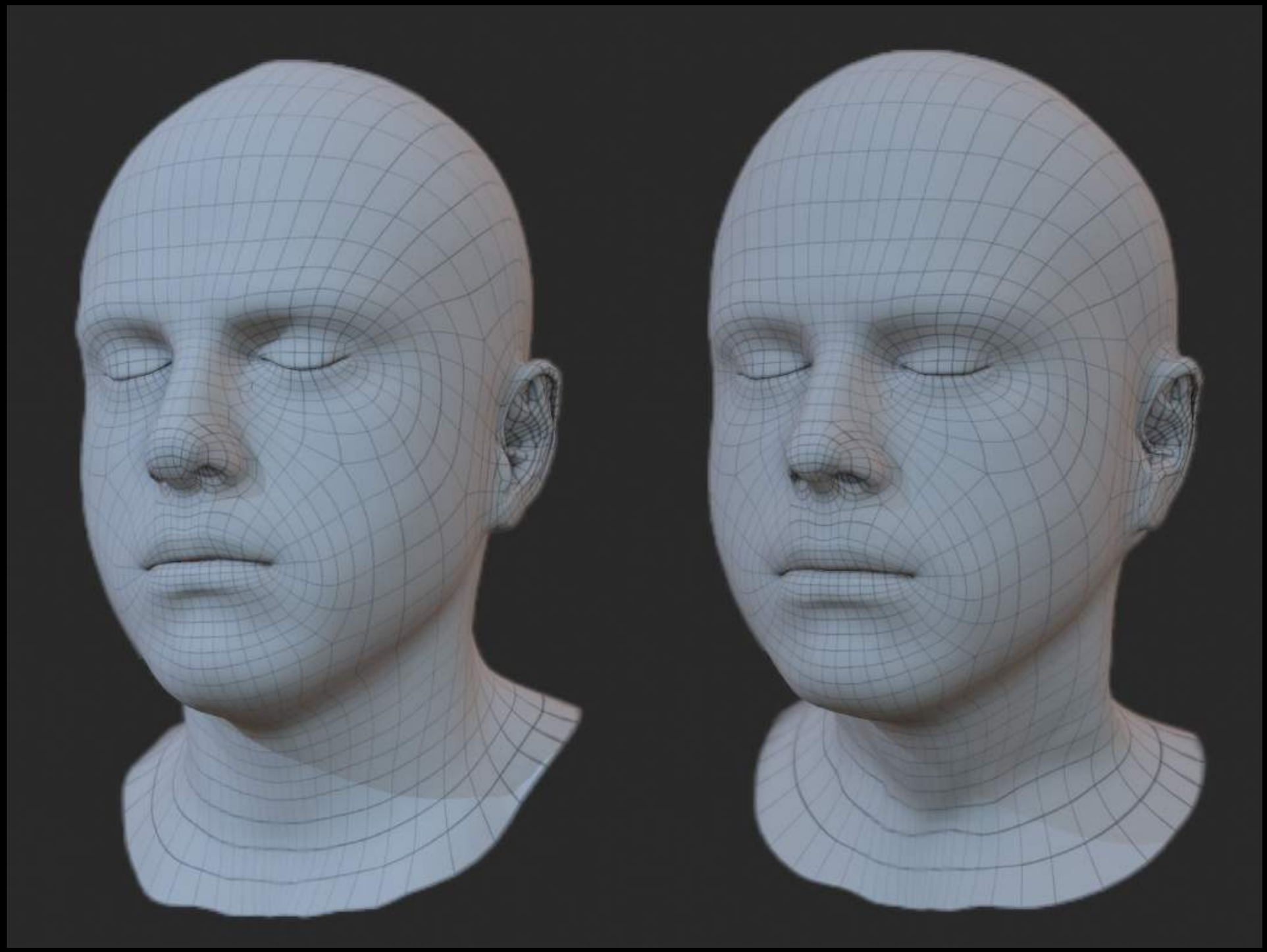
video

video

customize assets

Hi-Res Camera VS mobile phone

controlled light vs mobile - geometry



High Resolution Camera
+ Controlled Lighing conditions

Mobile Camera

controlled light vs mobile - shading

High Resolution Camera
+ Controlled Lighing conditions

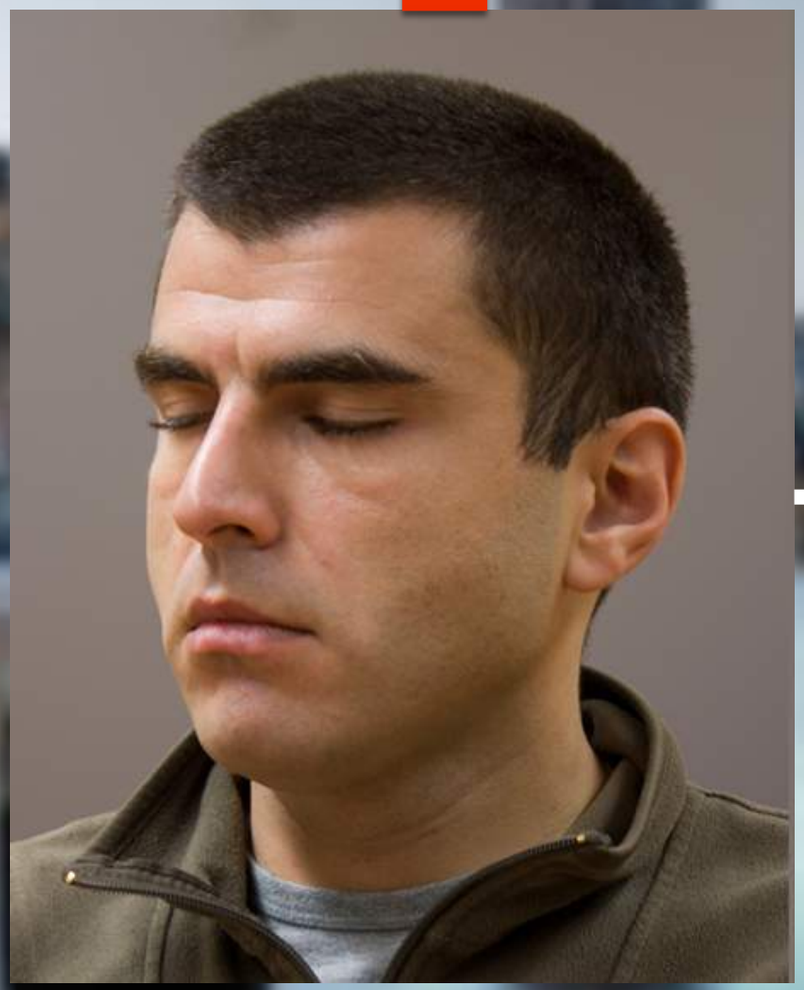
Mobile Camera

Markerless Motion Capture

video

and how about

Virtual Reality



you

your AVATAR

In a **movie** with your favorite actor!

In a **concert** playing with our favorite band!

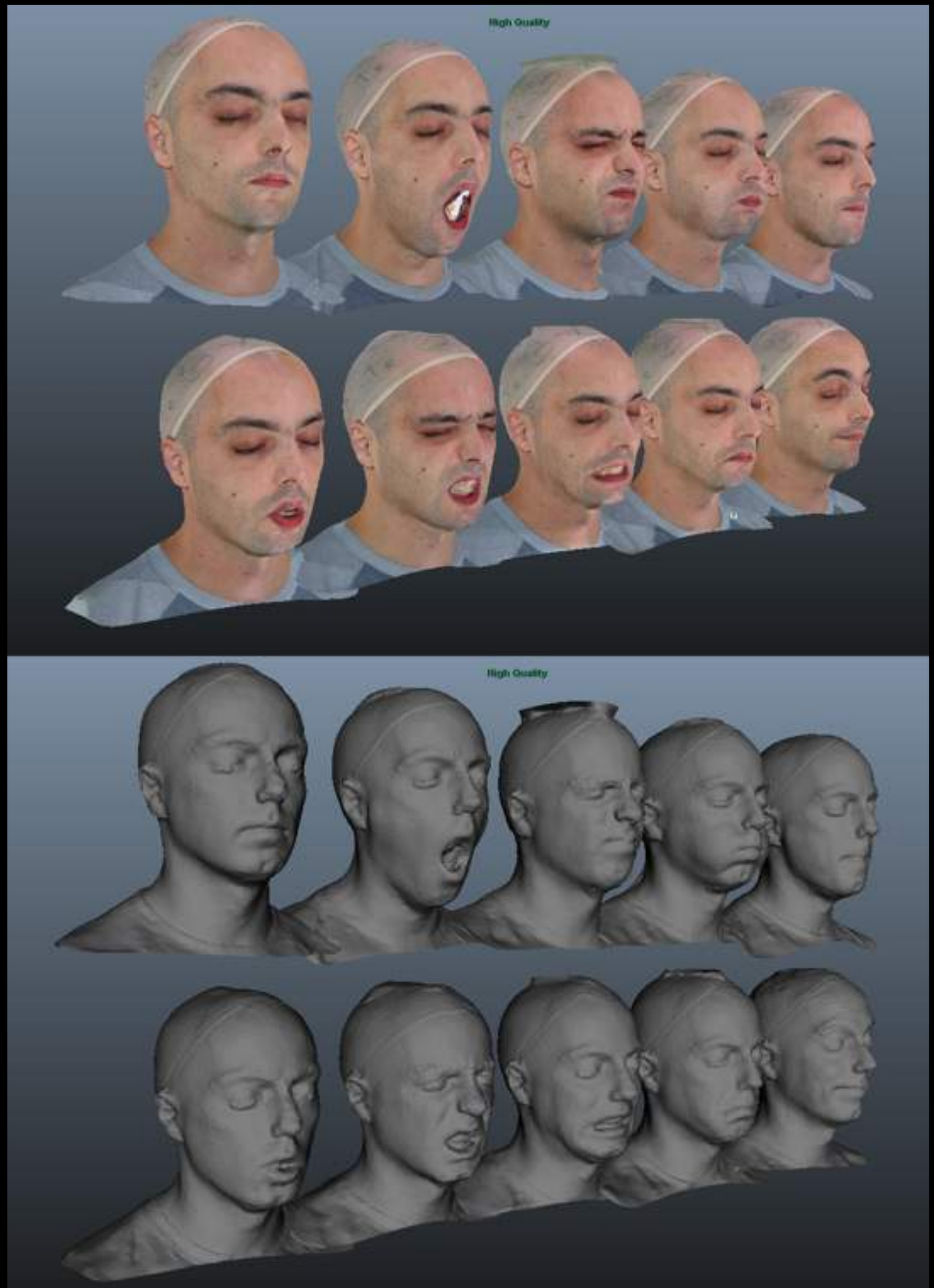
In a **videogame** playing with Ronaldo!

experiment Setup
Immersive Virtual Mirror

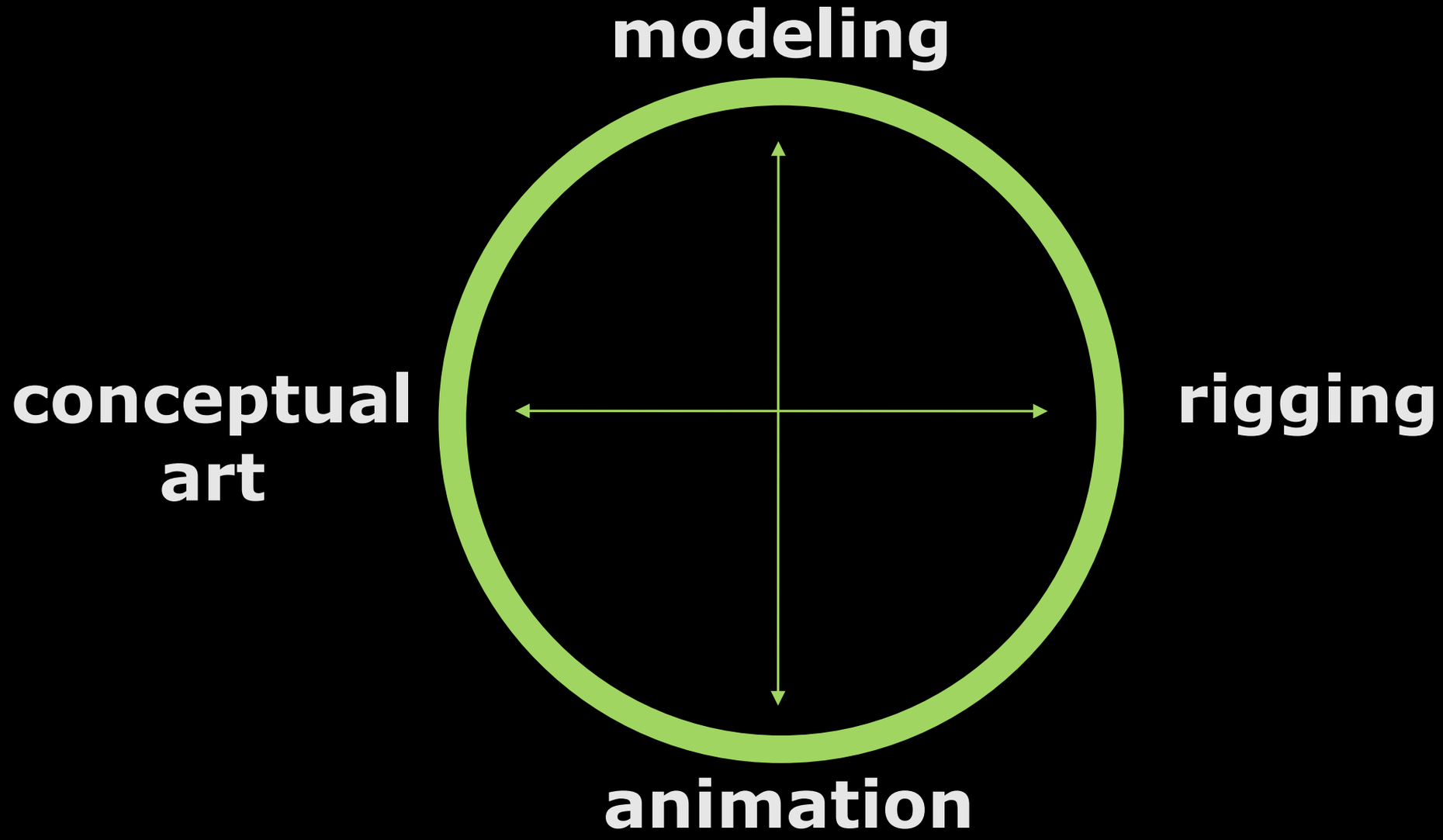
video

what next?

1. conversational avatars
2. emotional intelligent avatars
3. facial subtleties


High Quality
High Quality

just a thought
would this work?



thank you !

contact info:

veronica.orvalho@dcc.fc.up.pt

veronica.orvalho@gmail.com

http://picsquare.io

www.portointeractivecenter.org