



SIGGRAPH 2023
LOS ANGELES+ 6-10 AUG

K H R O N O S
G R O U P



Standardizing Body Attachment Points for 3D Commerce Virtual Try On

Patrick Hadley - 8/10/2023

Agenda

- Intro
- Problems with Virtual Try On (VTO) Interoperability
- Four proposed new glTF extensions
 - Footwear
 - Eyewear
 - Wrist (watch / bracelet)
 - Ring
- Future extensions (apparel, jewelry, handbag)
- Framework applications for avatar interoperability
- Q&A

About Me



Patrick Hadley [Snapchat]

- Snap AR: Product Manager AR Shopping Technology
- Khronos: Chair, Skeletal & Facial Anchoring / 3D Commerce
- Previously worked at Amazon building new 3D initiatives



glTF and PBR Helped Standardize 3D Commerce



glTF™ 2.0 Specification

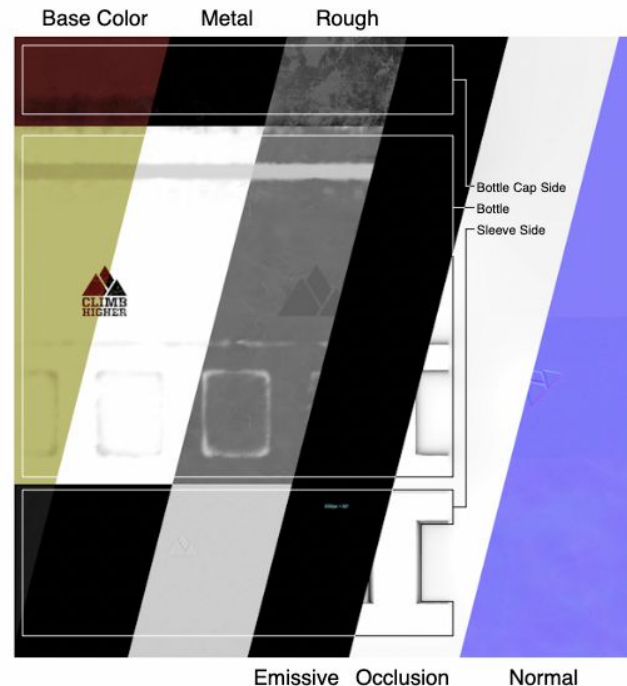


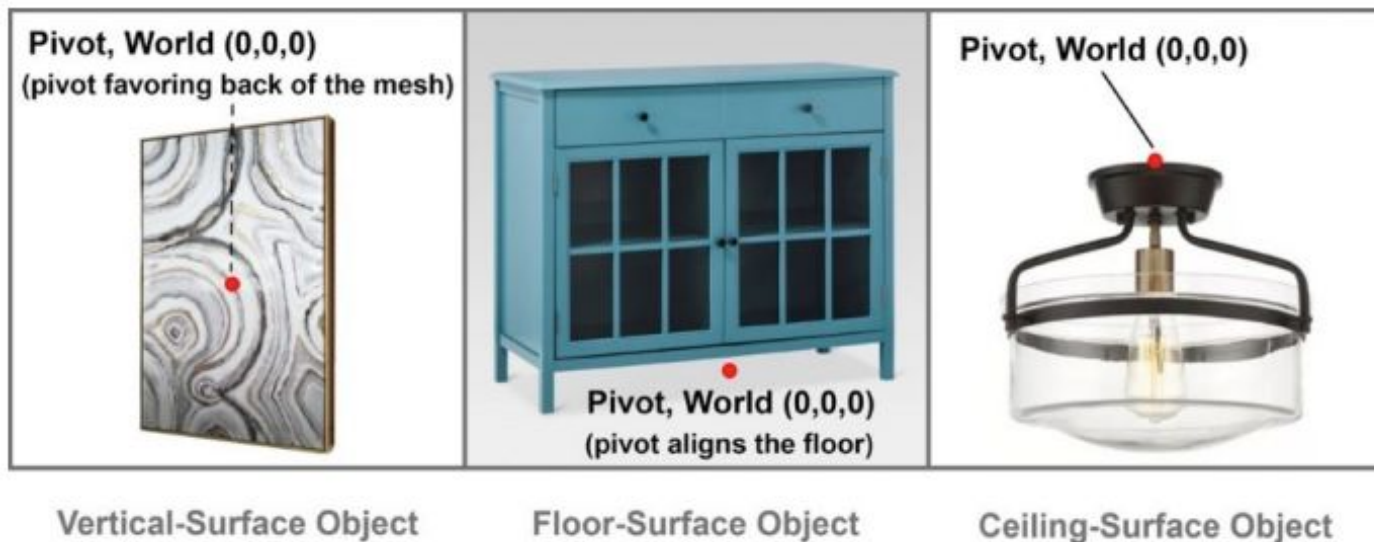
Figure 7. Physically Based Rendering Example

3D Commerce Initial Focus on Furniture / Home

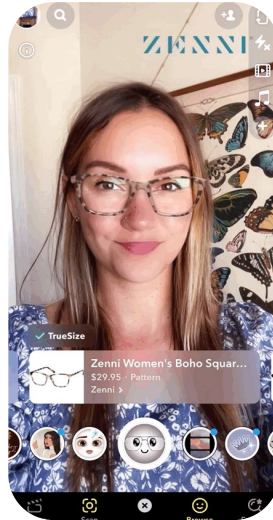
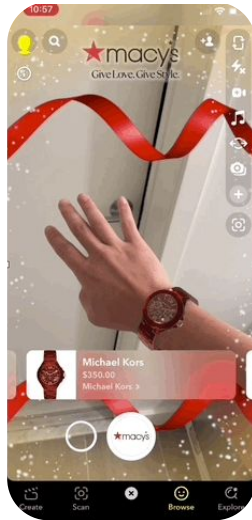


Furniture (Surface) Placement

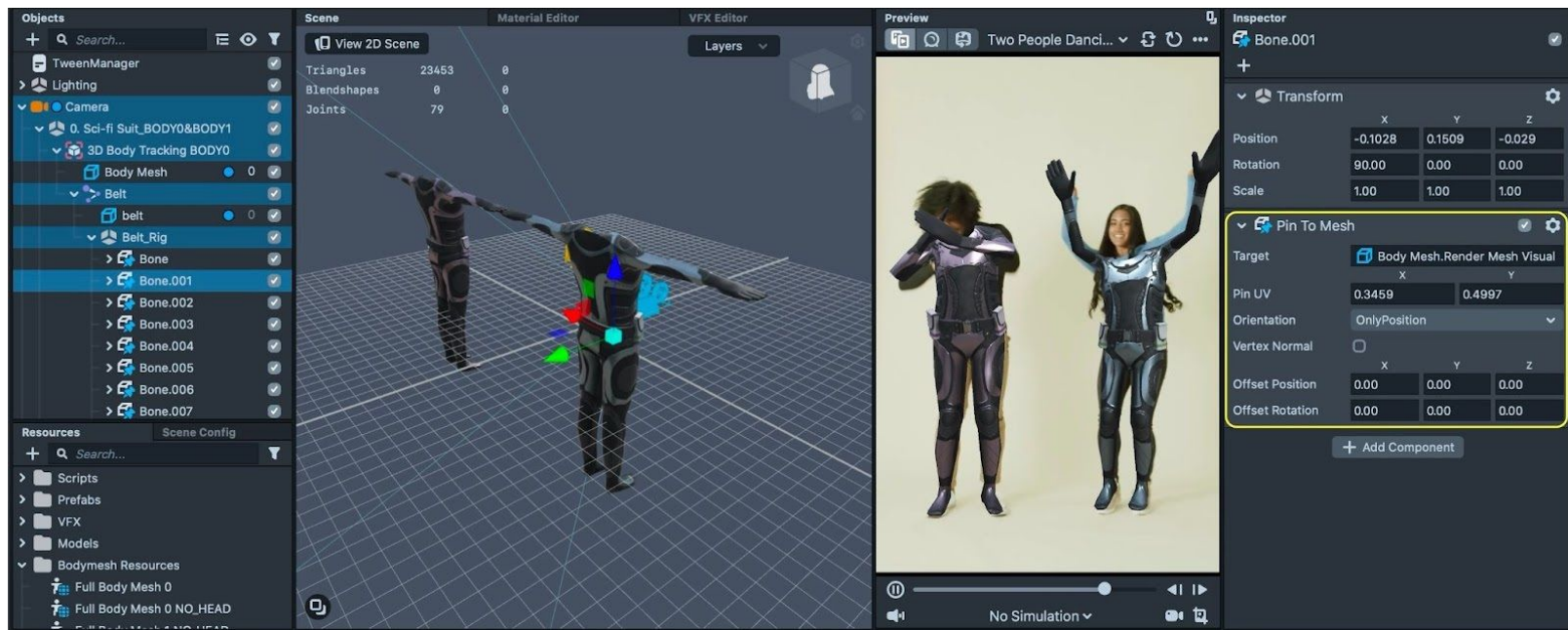
Asset Pivot Point (Placement, hanging points)



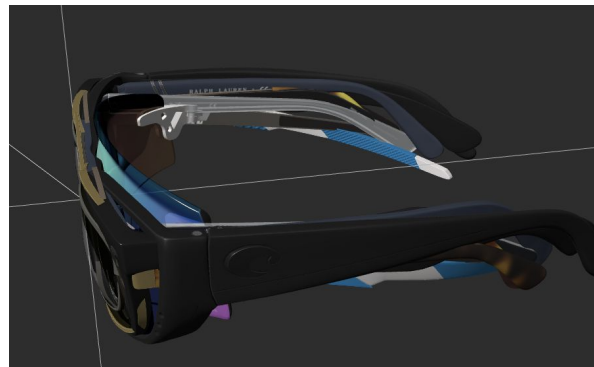
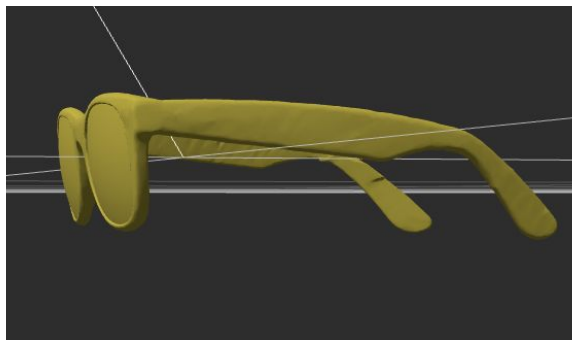
New Frontiers



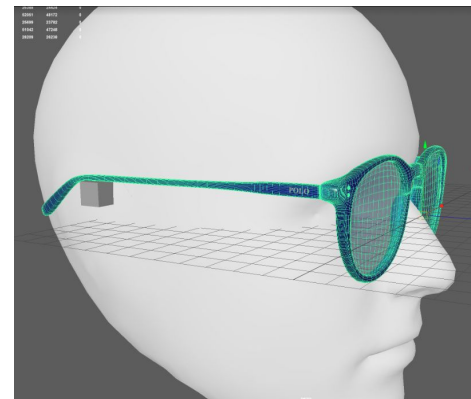
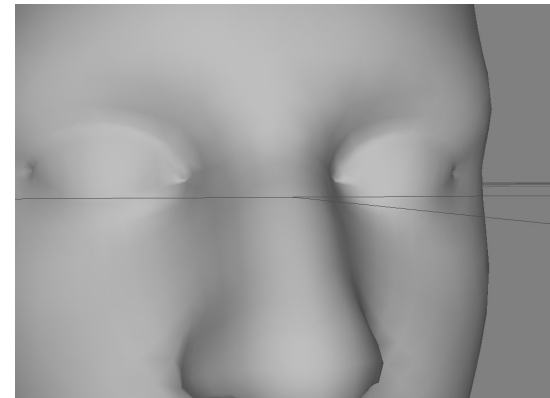
AR Creation - Manual Placement and Fitting



Challenges With Automation / Scale - Glasses



Challenges With Automation / Scale - Glasses



Challenges With Automation / Scale - Shoes

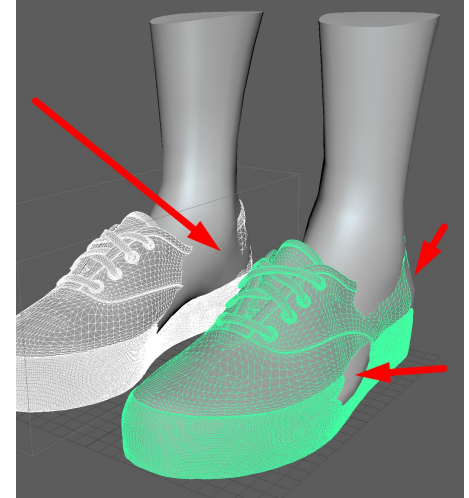
Occluder Placement



Ankle Clipping





Narrow Clipping



Need to Extend Focus to 3D / Body Interaction

- Lack of virtual try on (VTO) standards limit interoperability

Placement	Clipping / Collisions
	

Skeletal and Facial Body Anchor WG - Goals

1

Consistent

2

Best (Optimal) Fit

3

Easy to Use

4

Allows for Automation (No Touch)

Body Anchor Proposal - Framework

Medical / Precise Term	Khronos readable	Type	Required?	Description / Comments
Category				
Body Part				
Point 1	category_point1	Anchor	Required	More descriptive text
Point 2	category_point2	Fit / Clipping	Optional	More descriptive text
Point 3	category_point3	Attachment	Optional	More descriptive text

- Anchor for placement (required)
- Fitting / clipping (optional)
- Fixed attachment points (optional)

Addressing Footwear Challenges

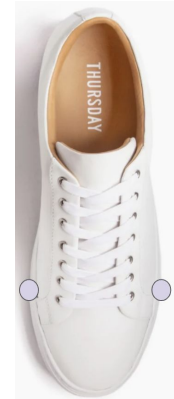
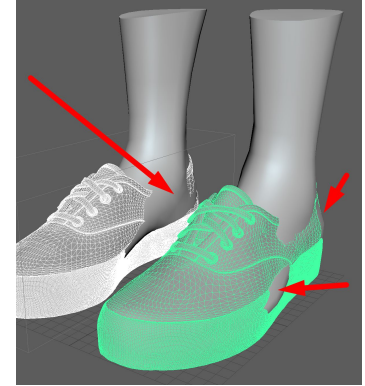
Occluder Placement



Ankle Clipping



Narrow Clipping



Body Anchor Proposal - Footwear

1

Occluder Placement



2

Ankle Clipping

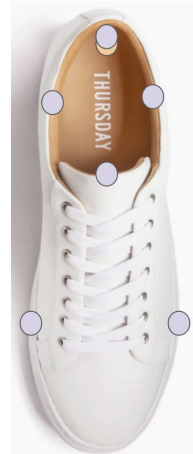


3

Narrow Clipping



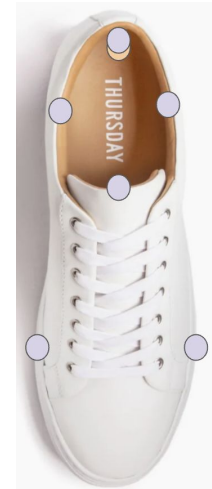
	Medical / Precise Term	Khronos readable	Type	Required?
Footwear (Sneakers)				
Ref	Leg			
1	Shoe Sole Rear Heel	shoe_insole_rear	Anchor	Required
2	Shoe Ankle Opening Rear	shoe_ankle_rear	Fit / Clipping	Optional
2	Shoe Ankle Opening Front	shoe_ankle_front	Fit / Clipping	Optional
2	Shoe Ankle Opening Outer	shoe_ankle_outer	Fit / Clipping	Optional
2	Shoe Ankle Opening Inner	shoe_ankle_inner	Fit / Clipping	Optional
3	Shoe Sole Inner	shoe_insole_inner	Fit / Clipping	Optional
3	Shoe Sole Outer	shoe_insole_outer	Fit / Clipping	Optional



Body Anchor Proposal - Footwear

Medical / Precise Term	Khronos readable	Type	Required?	Description / Comments
Footwear (Sneakers)				
Leg				
Shoe Sole Rear Heel	shoe_insole_rear	Anchor	Required	used for placement, positioned on the back sole of the heel
Shoe Ankle Opening Rear	shoe_ankle_rear	Fit / Clipping	Optional	middle back of the top of the shoe ankle opening
Shoe Ankle Opening Front	shoe_ankle_front	Fit / Clipping	Optional	middle front of the top of the shoe tongue ankle opening
Shoe Ankle Opening Outer	shoe_ankle_outer	Fit / Clipping	Optional	middle side (away from the body) of the top of the shoe ankle opening
Shoe Ankle Opening Inner	shoe_ankle_inner	Fit / Clipping	Optional	middle side (towards the other leg) of the top of the shoe ankle opening
Shoe Sole Inner	shoe_insole_inner	Fit / Clipping	Optional	furthest point on the inside of the foot (positioned on the sole), just before the toebox
Shoe Sole Outer	shoe_insole_outer	Fit / Clipping	Optional	furthest point on the outside of the foot (positioned on the sole), just before the toebox

- Currently focused on Sneakers
- One placement anchor (required)
- Six 'optional' for clipping / fitting



Body Anchor Proposal - Eyewear

Medical / Precise Term	Khronos readable	Type	Required?	Description / Comments
Glasses				
Head				
Nose Bridge	eyewear_nosebridge	Anchor	Required	used for placement, positioned on the bottom of the nose bridge
Left Ear Contact with Glasses Temple	eyewear_l_ear_glassestemple	Anchor	Required	placed where the glasses' left temple contacts the ear
Right Ear Contact with Glasses Temple	eyewear_r_ear_glassestemple	Anchor	Required	placed where the glasses' right temple contacts the ear
Left Lens Bottom Center Point	eyewear_l_lens_bottom	Fit / Clipping	Optional	point marking the bottom center of the left lens (at the bottom of the lens frame)
Right Lens Bottom Center Point	eyewear_r_lens_bottom	Fit / Clipping	Optional	point marking the bottom center of the right lens (at the bottom of the lens frame)

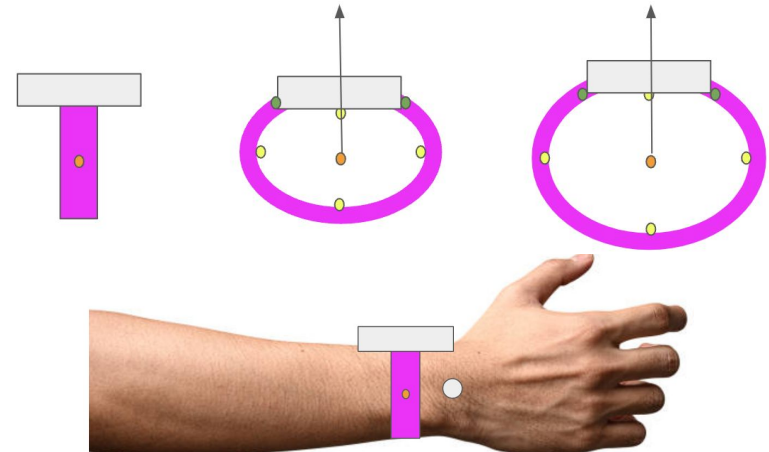
- Applies to glasses / sunglasses
- Three placement anchors (req)
- Two 'optional' for fit / clipping



Body Anchor Proposal - Wrist (Watch / bracelet)

Medical / Precise Term	Khronos readable	Type	Required?	Description / Comments
Wrist (Watch / Bracelet)				
Arm				
Wristband Center	wristband_center	Anchor	Required	used for placement, positioned on the center of the circle of the band
Wristband Top	wristband_top	Fit / Clipping	Optional	positioned on the inside of the band at the top (facing out from the wrist)
Wristband Bottom	wristband_bottom	Fit / Clipping	Optional	positioned on the inside of the band at the bottom (towards the inside of the wrist)
Wristband Inner	wristband_inner	Fit / Clipping	Optional	positioned on the inside of the band at the inner side of the wrist (towards thumb)
Wristband Outer	wristband_outer	Fit / Clipping	Optional	positioned on the inside of the band at the outer side of the wrist (towards pinky)
Watch Face Attachment - Outer	watchface_outer	Attachment	Optional	positioned on the outer attachment of the fixed 'face' (doesn't change size)
Watch Face Attachment - Inner	watchface_inner	Attachment	Optional	positioned on the inner attachment of the fixed 'face' (doesn't change size)

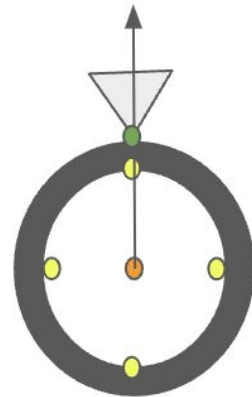
- Band is flexible, face can be fixed
- One placement anchors (req)
- Four 'optional' for fit / clipping
- Two 'optional' for watch face



Body Anchor Proposal - Ring

Medical / Precise Term	Khronos readable	Type	Required?	Description / Comments
Ring				
Fingers				
Ring Center	ring_center	Anchor	Required	used for placement, positioned on the center of the circle of the ring
Ring Top	ring_top	Fit / Clipping	Optional	positioned on the inside of the ring at the top (facing out from the back of the hand)
Ring Bottom	ring_bottom	Fit / Clipping	Optional	positioned on the inside of the ring at the bottom (towards the palm of the hand)
Ring Inner	ring_inner	Fit / Clipping	Optional	positioned on the inside of the ring at the inner side of the finger (towards thumb side)
Ring Outer	ring_outer	Fit / Clipping	Optional	positioned on the inside of the ring at the outer side of the wrist (towards pinky side)
Ring Setting	ring_setting	Attachment	Optional	positioned on the bottom center of the ring setting (doesn't change size - diamond, etc)

- Band is flexible, setting can be fixed
- One placement anchors (req)
- Four 'optional' for fit / clipping
- One 'optional' for ring setting



Body Anchor - Avatar Interoperability

Today, there is no common approach when it comes to defining skeletal anchoring, causing challenges for interoperability and 3D to Human consistent interactions

[Simple] Mixamo has 8 points to define avatar motion

[Complex] Web3d Consortium defines 128 points

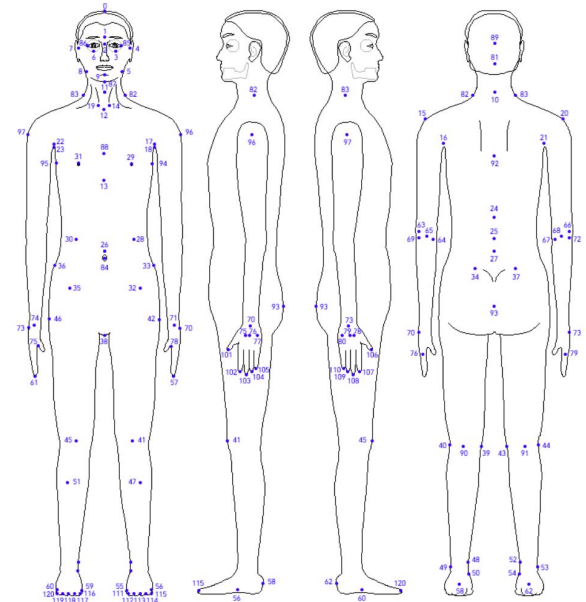
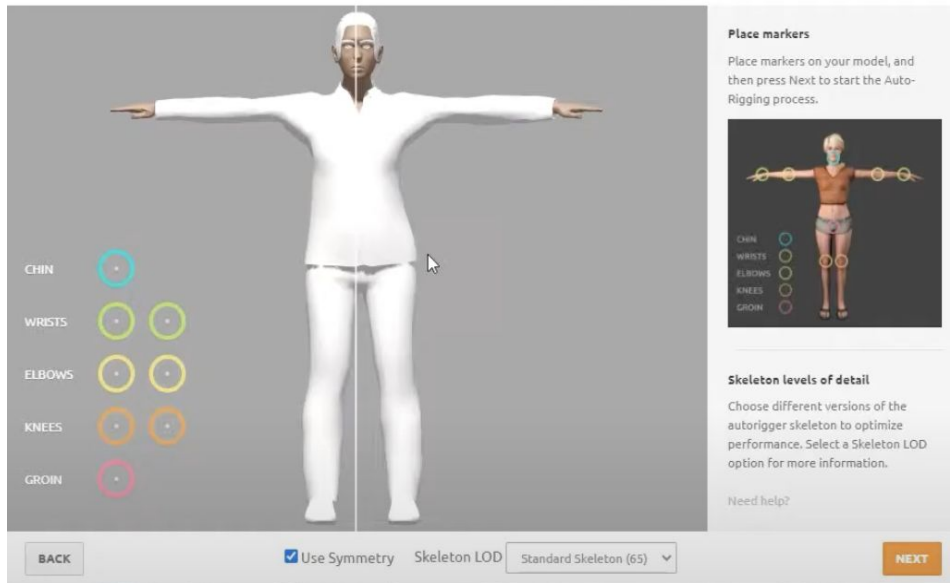
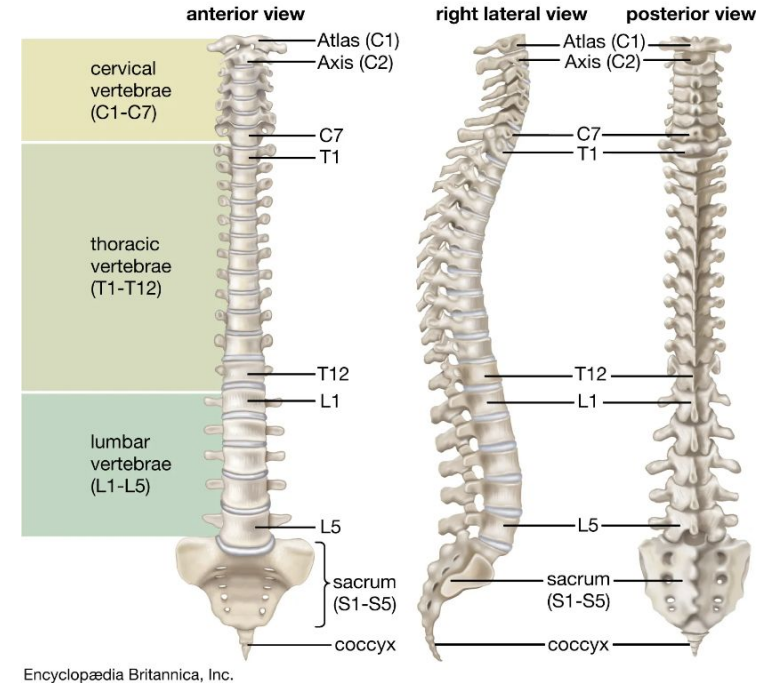


Figure B.1 – Feature points on the human body

Body Anchor - Avatar Interoperability

Medical / Precise Term	Khronos readable	Mixamo	Apple AR Kit	VRM	Unity
Torso					
Pelvic	j_pelvic	Groin	Root	Hips	Hips
lumbar vertebrae L5	j_spine_1			Spine	
lumbar vertebrae L4	j_spine_2				
lumbar vertebrae L3	j_spine_3				
lumbar vertebrae L2	j_spine_4				
lumbar vertebrae L1	j_spine_5			Chest	Spine
thoracic vertebrae T12	j_spine_6				
thoracic vertebrae T11	j_spine_7				
thoracic vertebrae T10	j_spine_8				
thoracic vertebrae T9	j_spine_9				
thoracic vertebrae T8	j_spine_10				
thoracic vertebrae T7	j_spine_11				
thoracic vertebrae T6	j_spine_12				
thoracic vertebrae T5	j_spine_13				Chest
thoracic vertebrae T4	j_spine_14				
thoracic vertebrae T3	j_spine_15				
thoracic vertebrae T2	j_spine_16				
thoracic vertebrae T1	j_spine_17				
cervical vertebrae C7	j_spine_18		Neck	Upper Chest	
cervical vertebrae C6	j_spine_19				
cervical vertebrae C5	j_spine_20				
cervical vertebrae C4	j_spine_21				
cervical vertebrae C3	j_spine_22				
cervical vertebrae C2	j_spine_23				
cervical vertebrae C1	j_spine_24				



Encyclopædia Britannica, Inc.

Body Anchor - Avatar Interoperability

Head
Head
Left Eye
Right Eye
Left Eyebrow
Right Eyebrow
Left Ear
Right Ear
Nose
Mouth
Chin

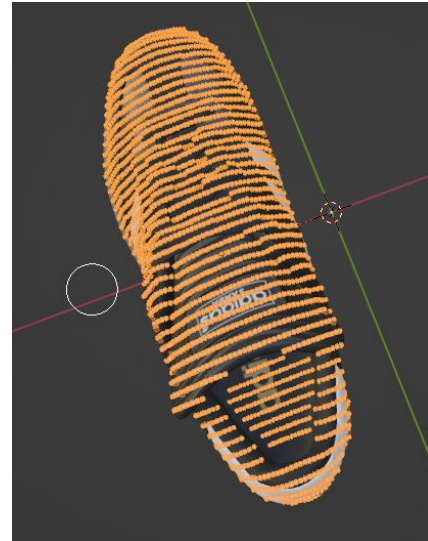
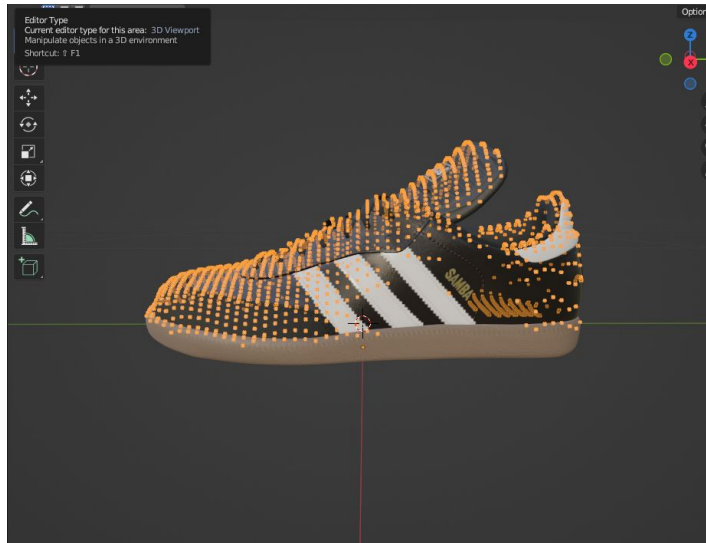
Arm
Left Shoulder
Right Shoulder
Left Upper Arm
Right Upper Arm
Left Lower Arm
Right Lower Arm
Left Hand
Right Hand

Fingers	Fingers (cont)
Left Thumb Metacarpal	Right Index Intermediate
Left Thumb Proximal	Right Index Distal
Left Thumb Distal	Right Middle Proximal
Left Index Proximal	Right Middle Intermediate
Left Index Intermediate	Right Middle Distal
Left Index Distal	Right Ring Proximal
Left Middle Proximal	Right Ring Intermediate
Left Middle Intermediate	Right Ring Distal
Left Middle Distal	Right Little Proximal
Left Ring Proximal	Right Little Intermediate
Left Ring Intermediate	Right Little Distal
Left Ring Distal	
Left Little Proximal	
Left Little Intermediate	
Left Little Distal	
Right Thumb Metacarpal	
Right Thumb Proximal	
Right Thumb Distal	
Right Index Proximal	

Leg
Left Upper Leg
Right Upper Leg
Left Lower Leg
Right Lower Leg
Left Foot
Right Foot
Left Great (Big) Toe
Left 2nd Toe
Left 3rd Toe
Left 4th Toe
Left Little (Pinky) Toe
Right Great (Big) Toe
Right 2nd Toe
Right 3rd Toe
Right 4th Toe
Right Little (Pinky) Toe

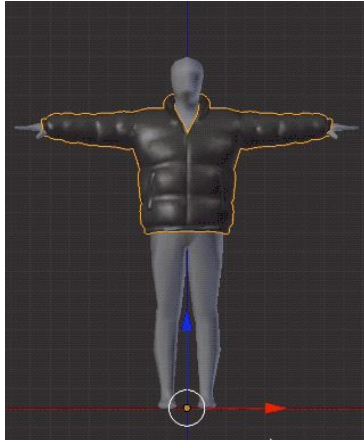
What's Next?

- Formal glTF extension review process in GitHub
- Ratify the glTF extension
- Develop tools to help creators apply to previously built 3D models



What's Next

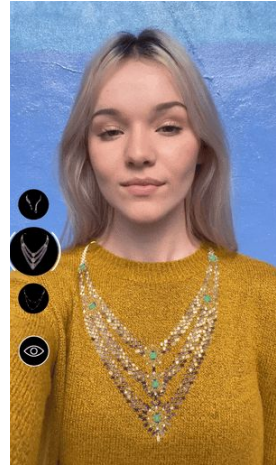
Apparel



Earrings



Necklaces



Handbag body try on





Questions?

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