

Learning a Shared Shape Space for Multimodal Garment Design

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Algeria
13000 BC



Old Kingdom
Egypt, 2600 BC



Western Han
China, 206 BC

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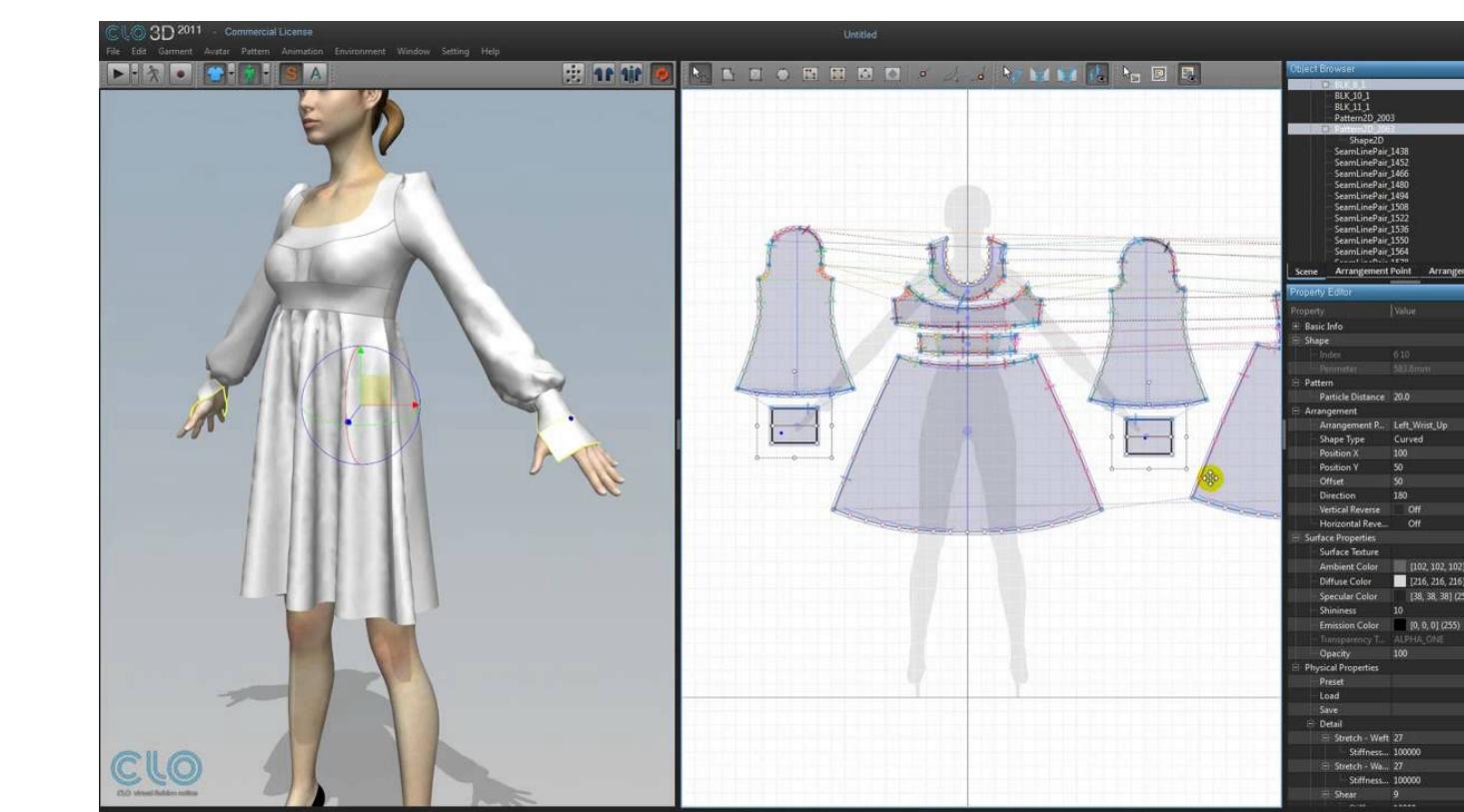
Chanel
1924 AD



Versace
1994 AD



Burberry
2016 AD





Narain et. al. 2012



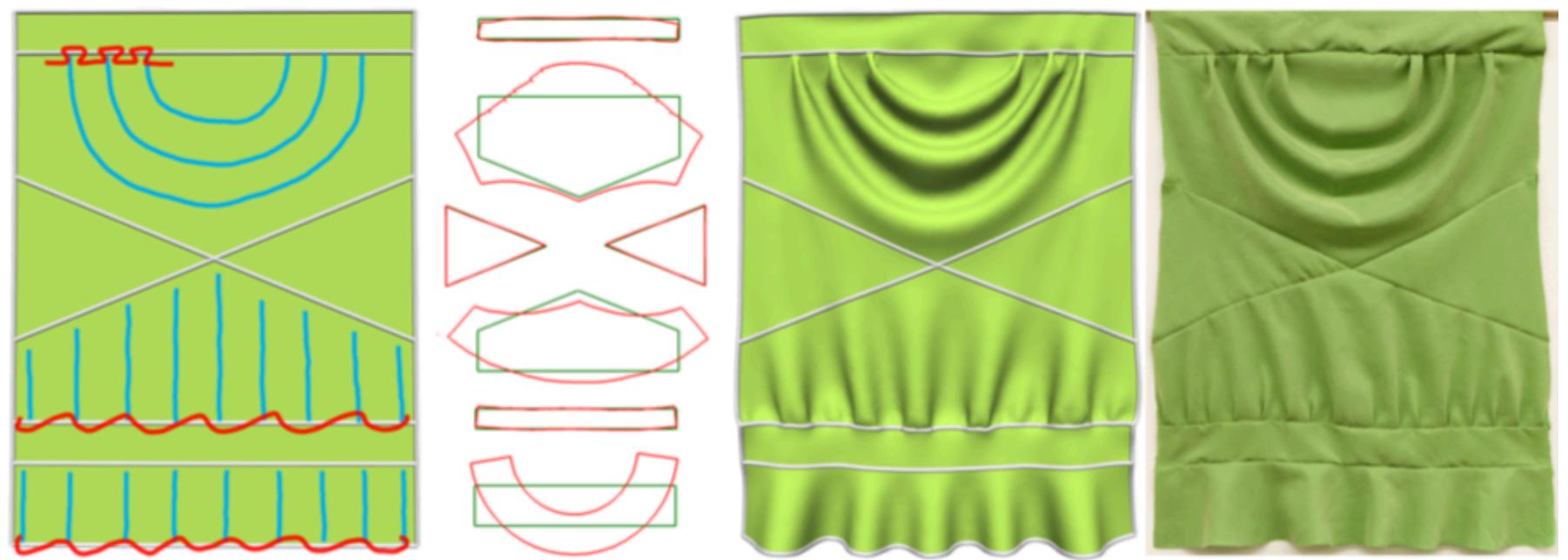
Berthouzoz et. al. 2013



Pons-moll et. al. 2017



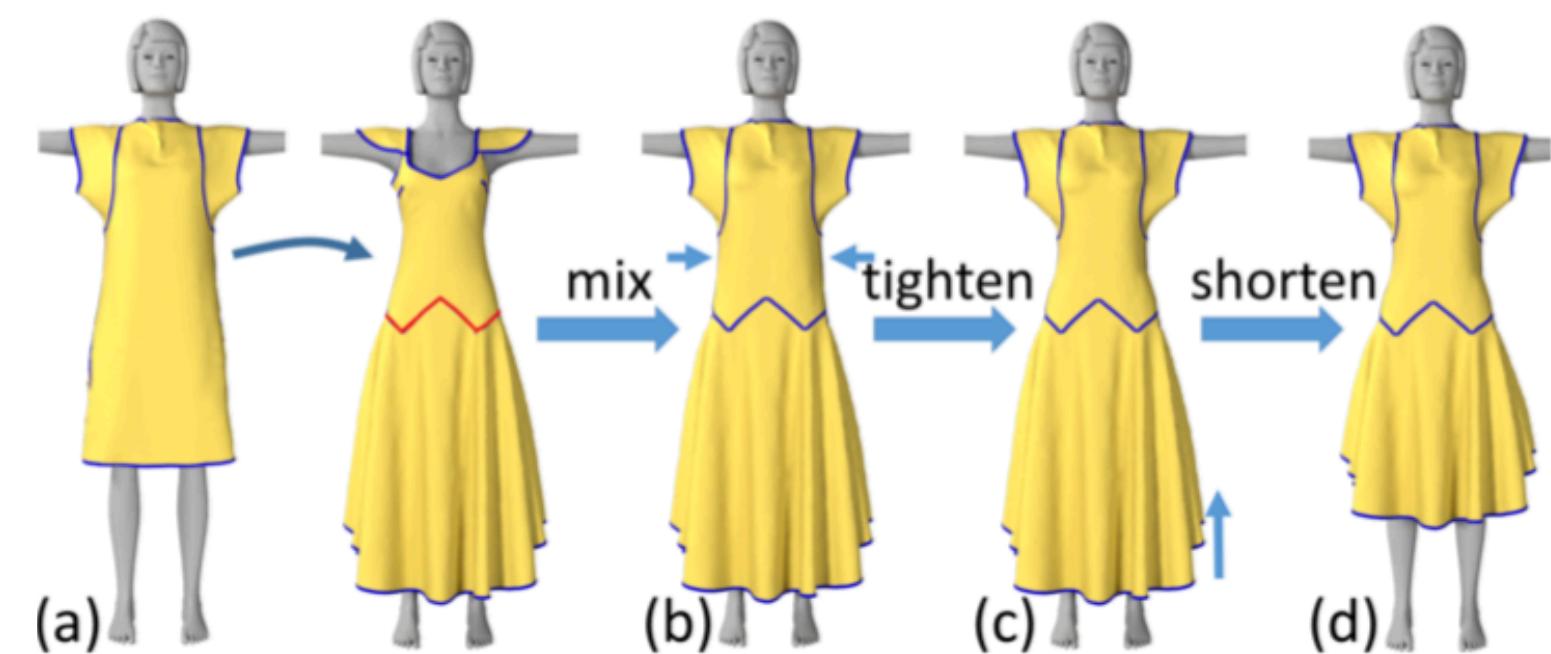
Yang et. al. 2016



Li et. al. 2018



Jung et. al.



Bartle et. al. 2017



Narain et. al. 2012



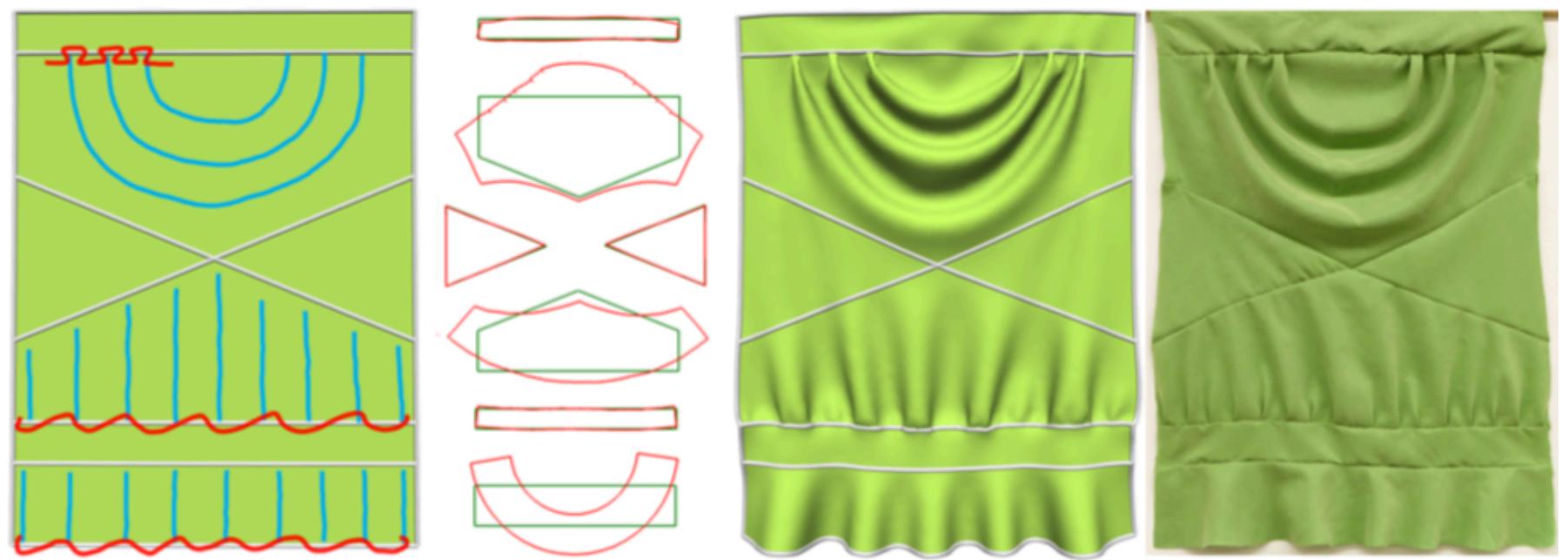
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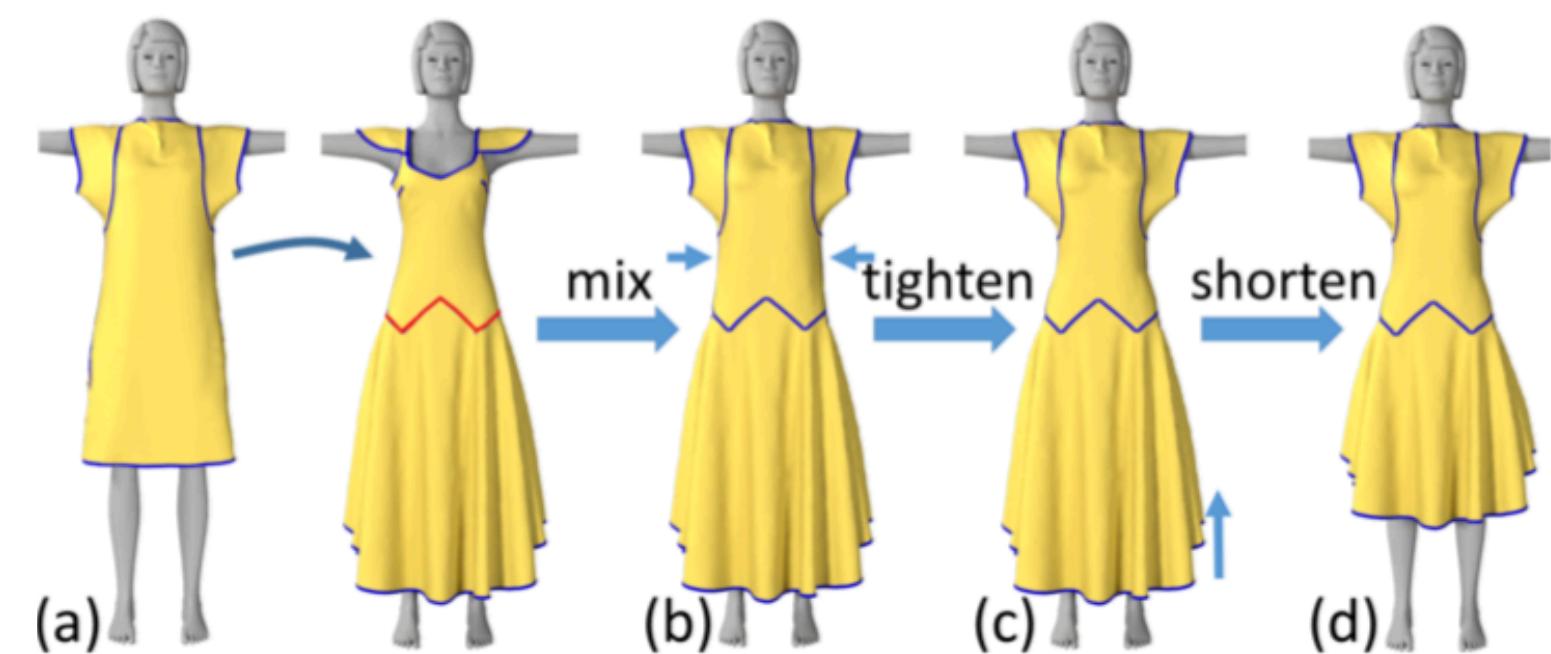
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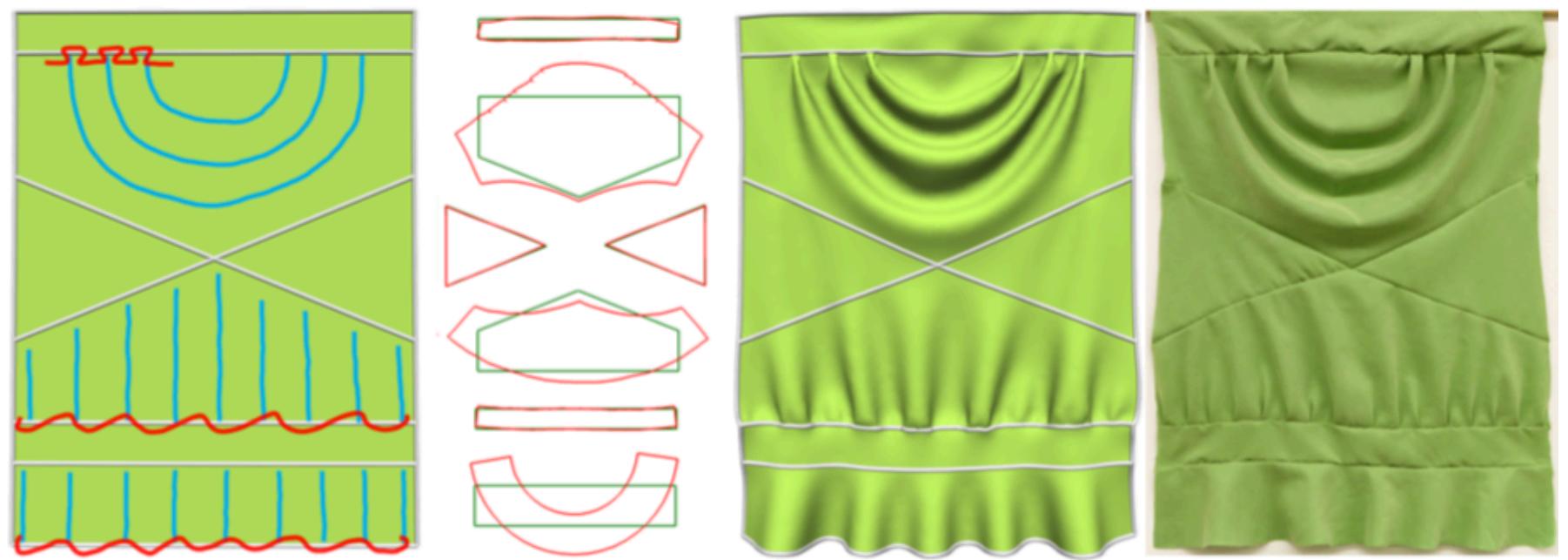
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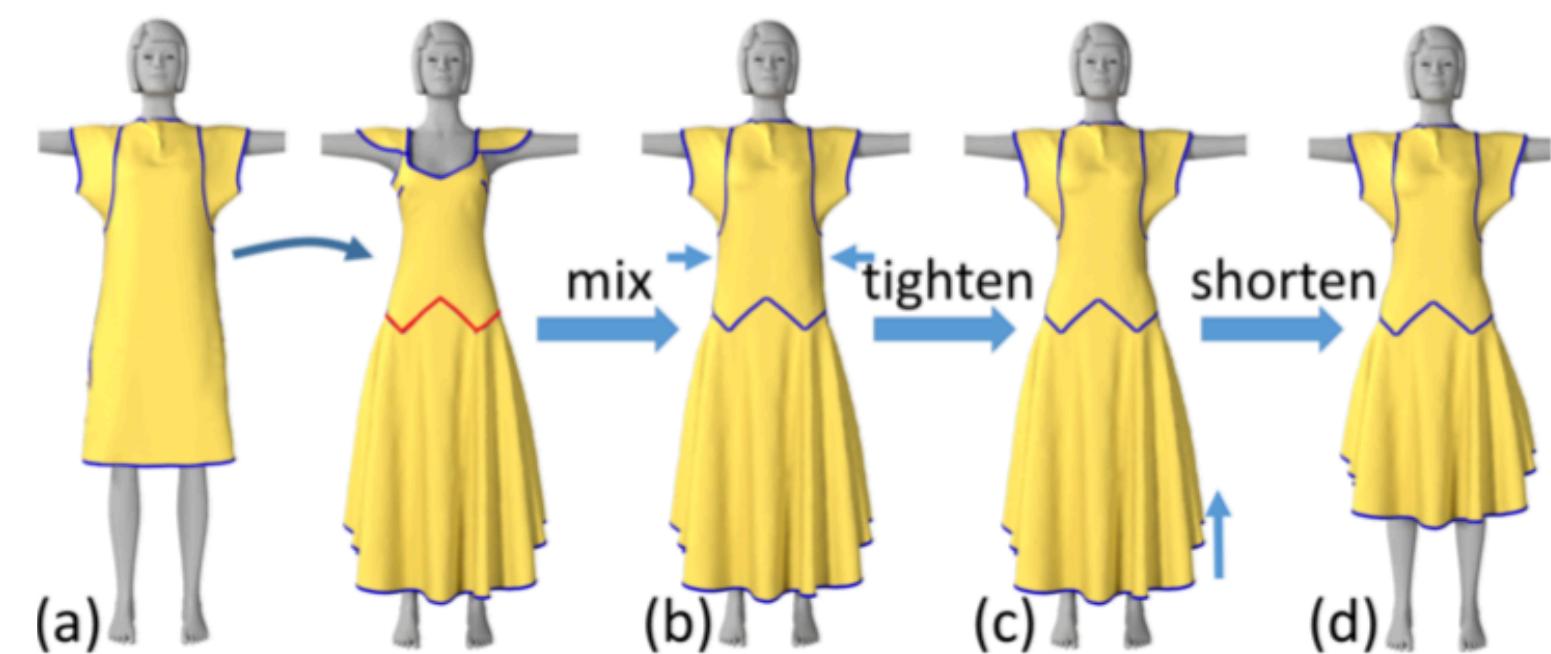
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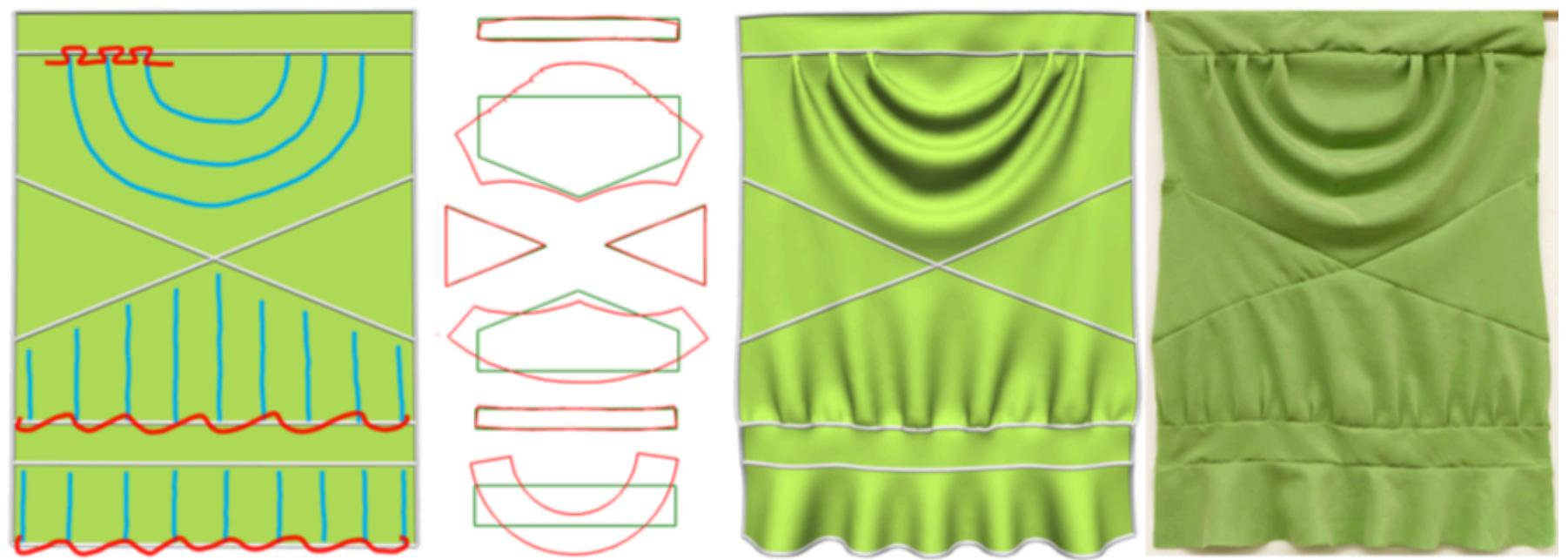
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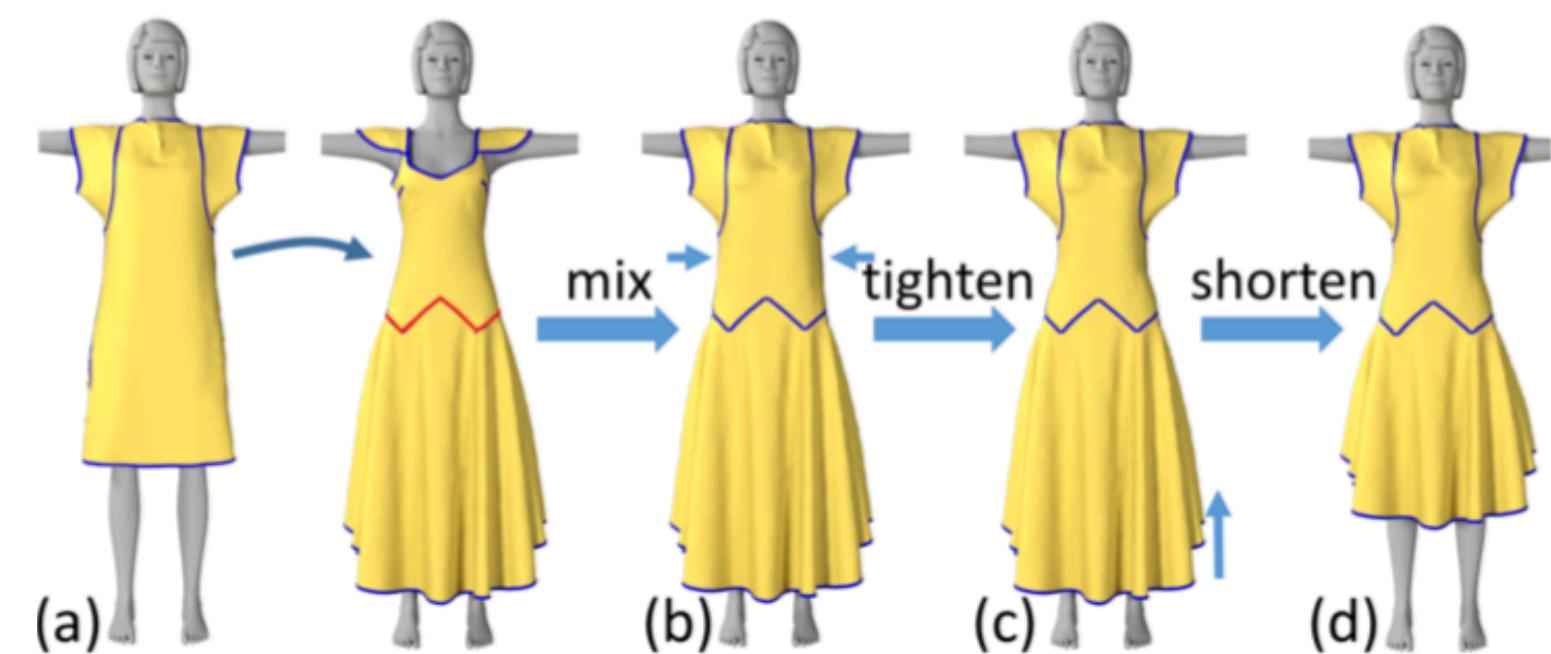
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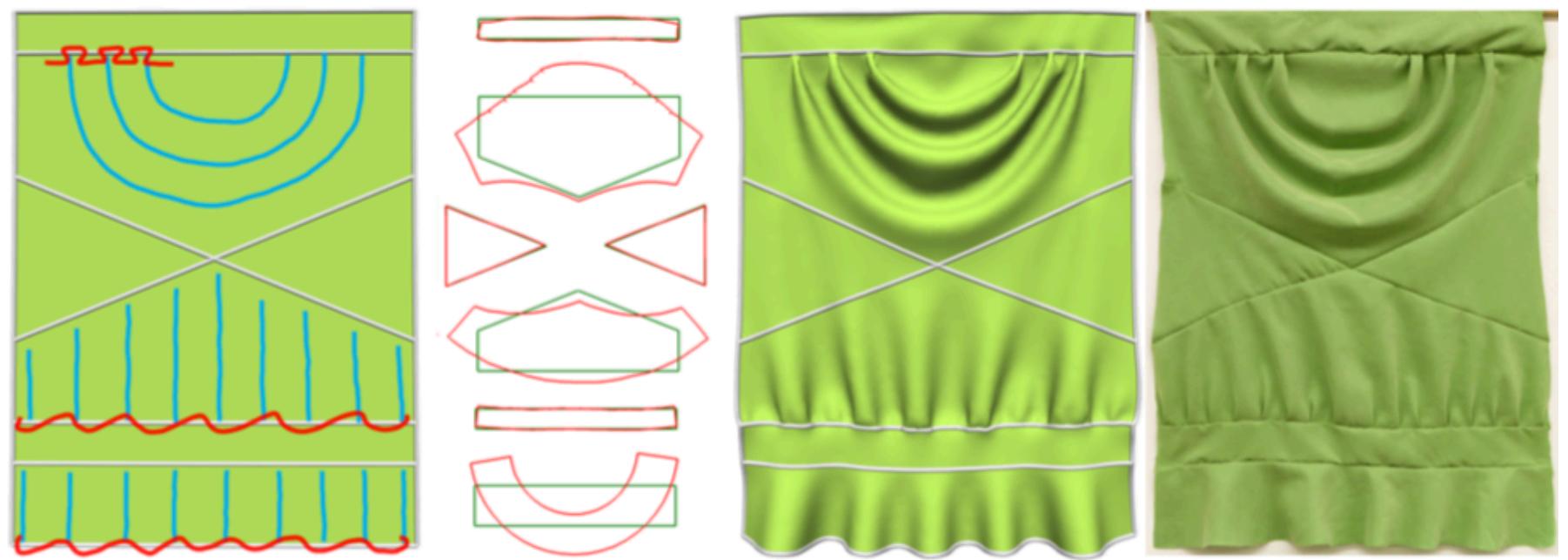
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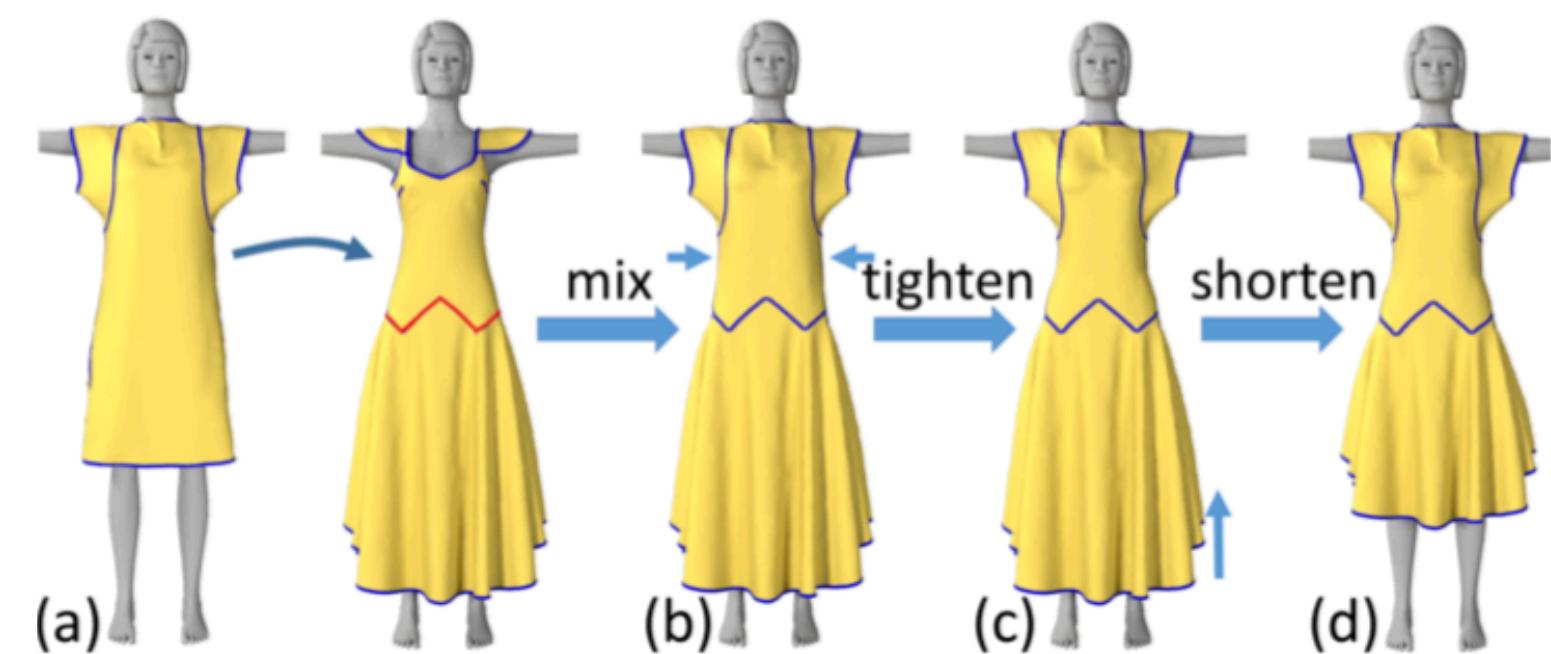
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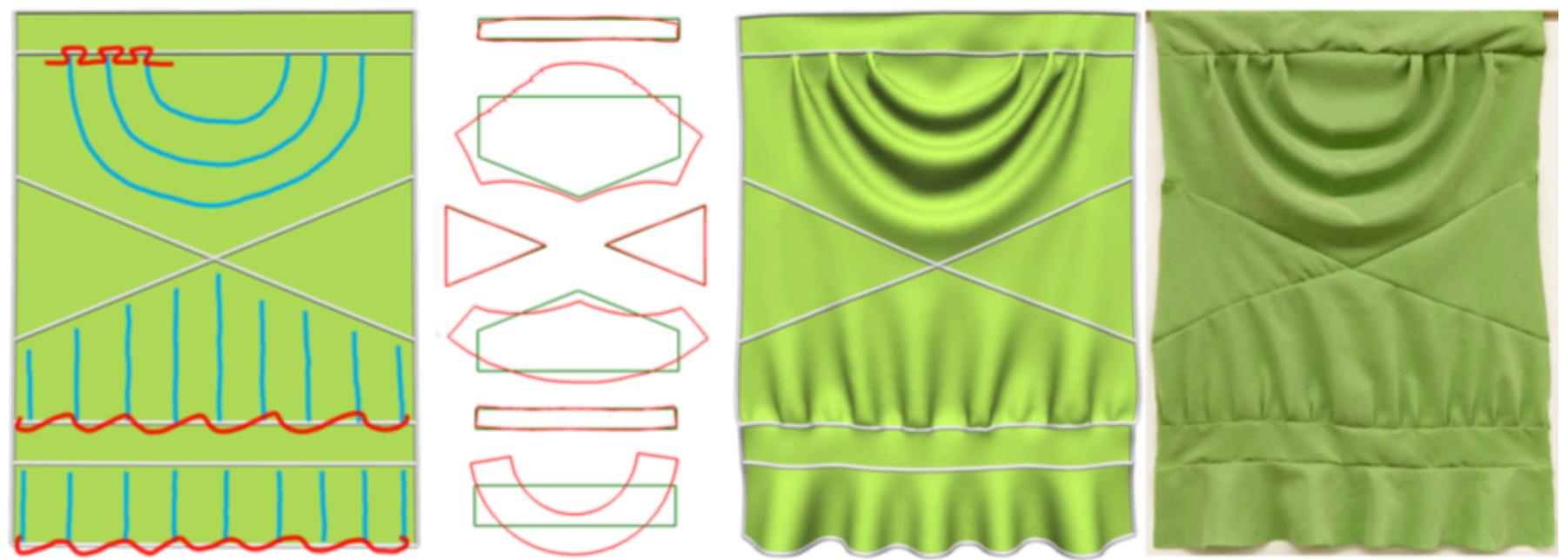
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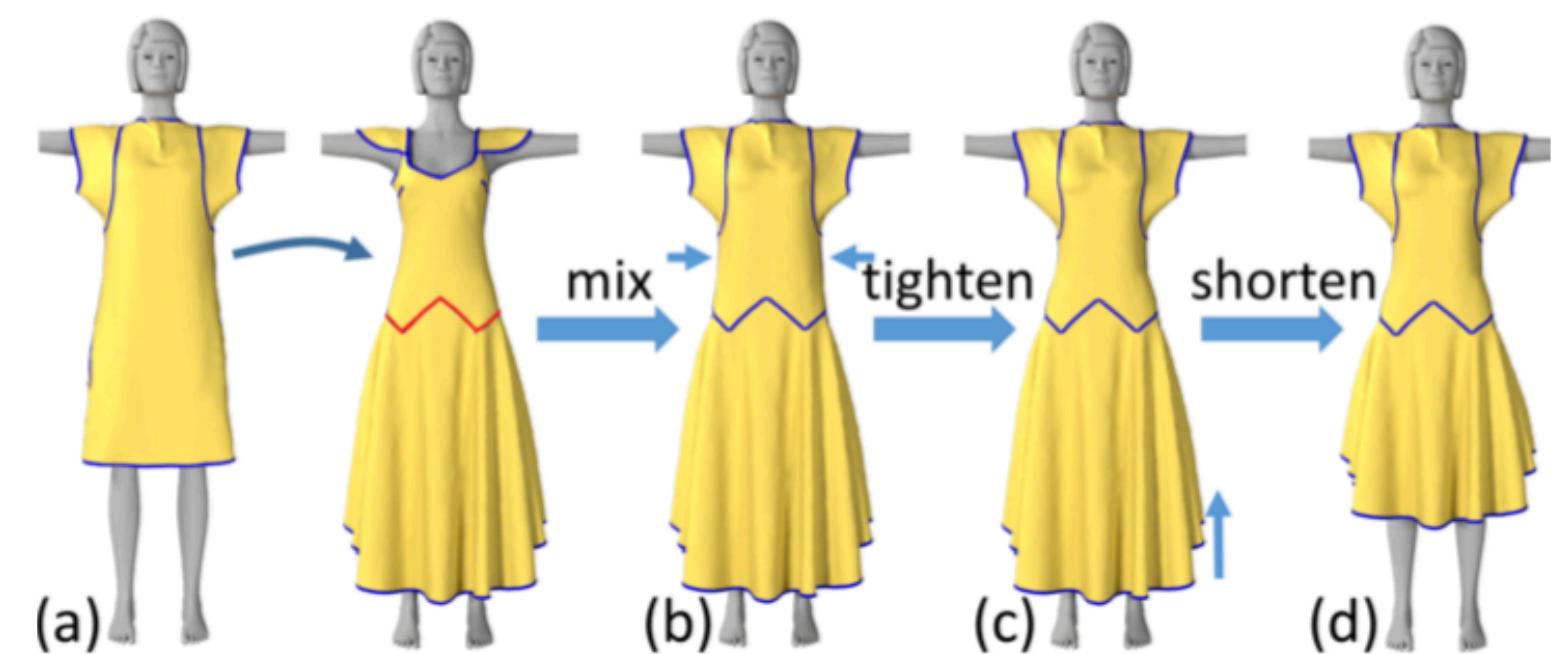
Yang et. al. 2016



Li et. al. 2018

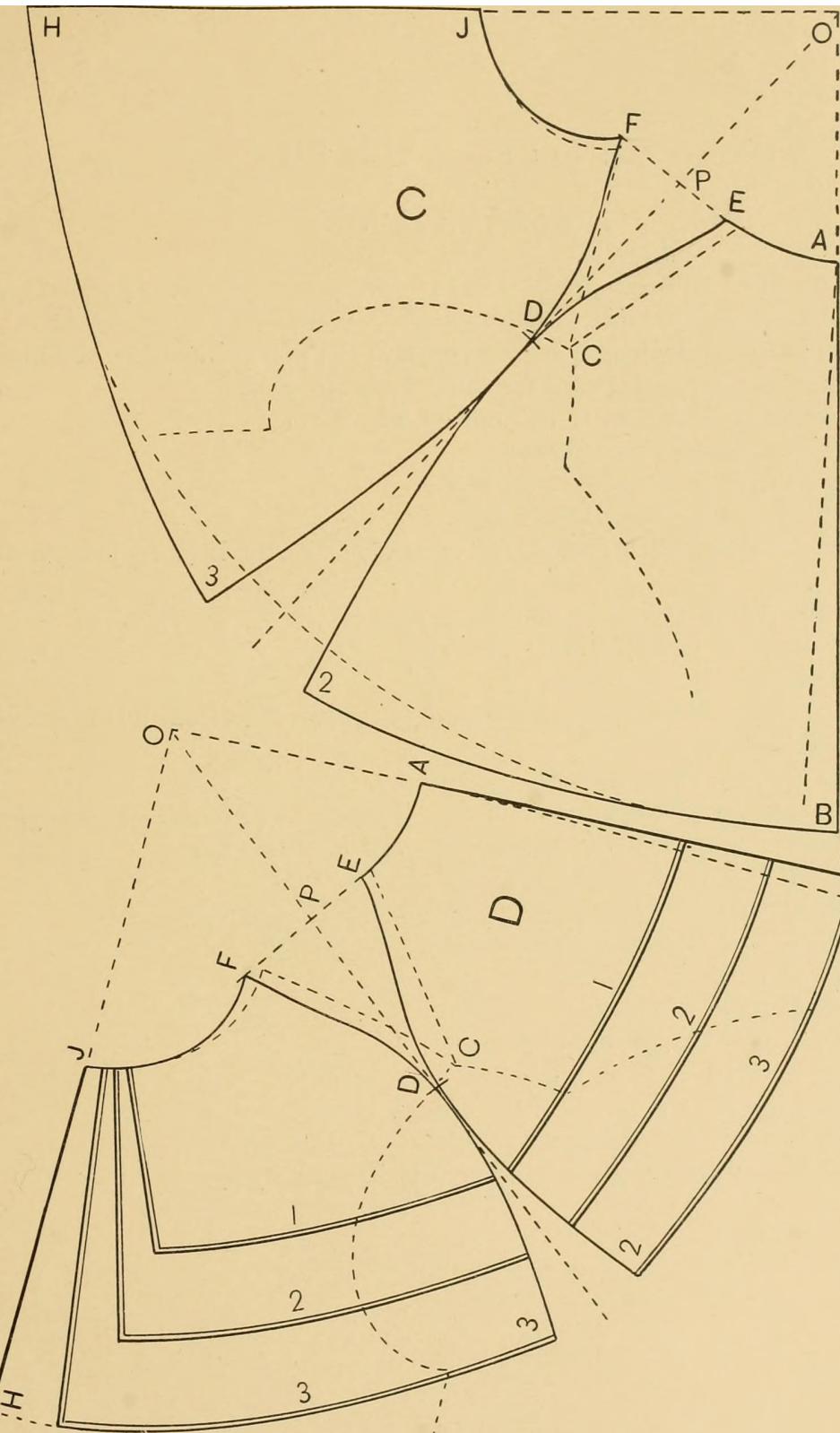


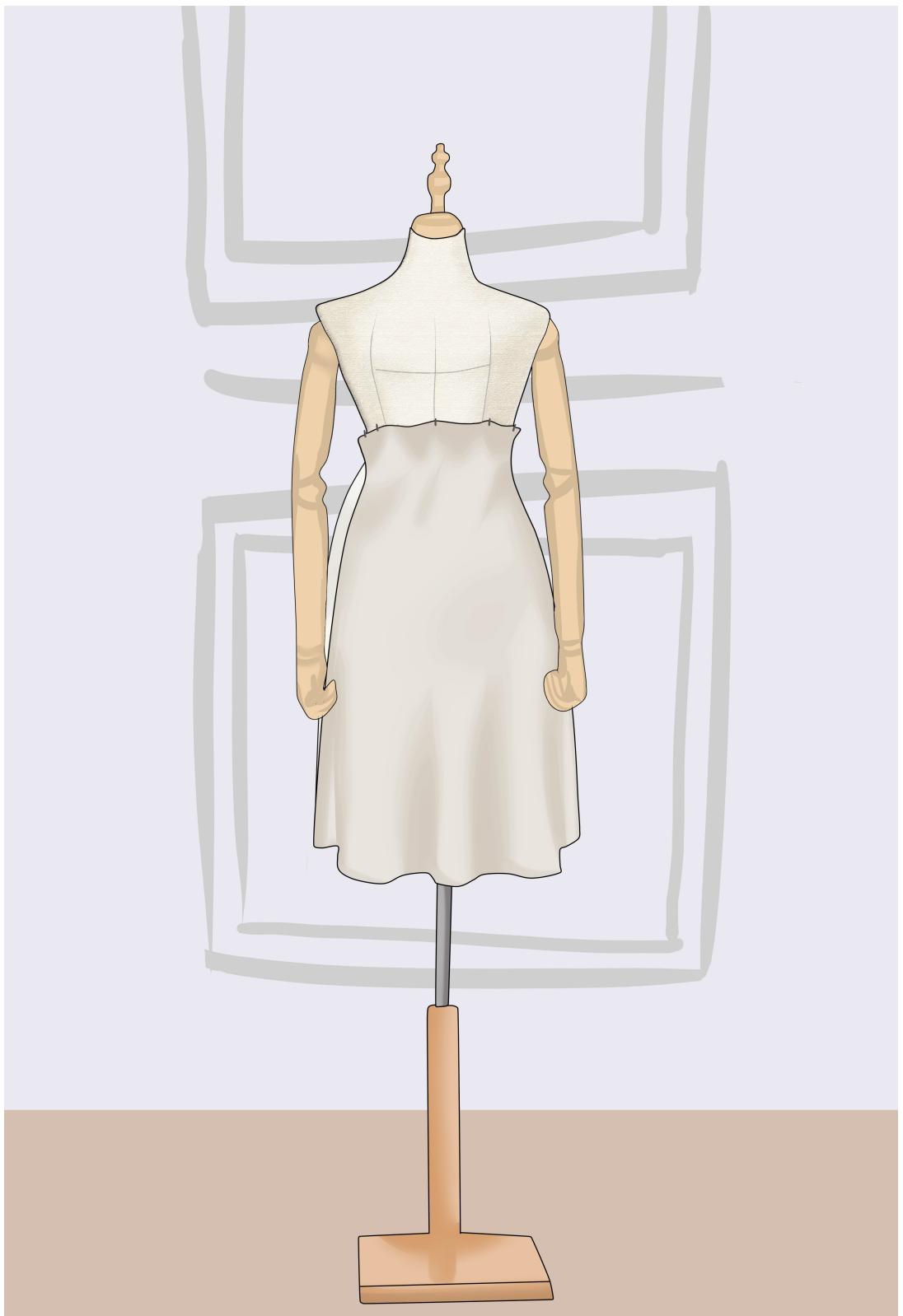
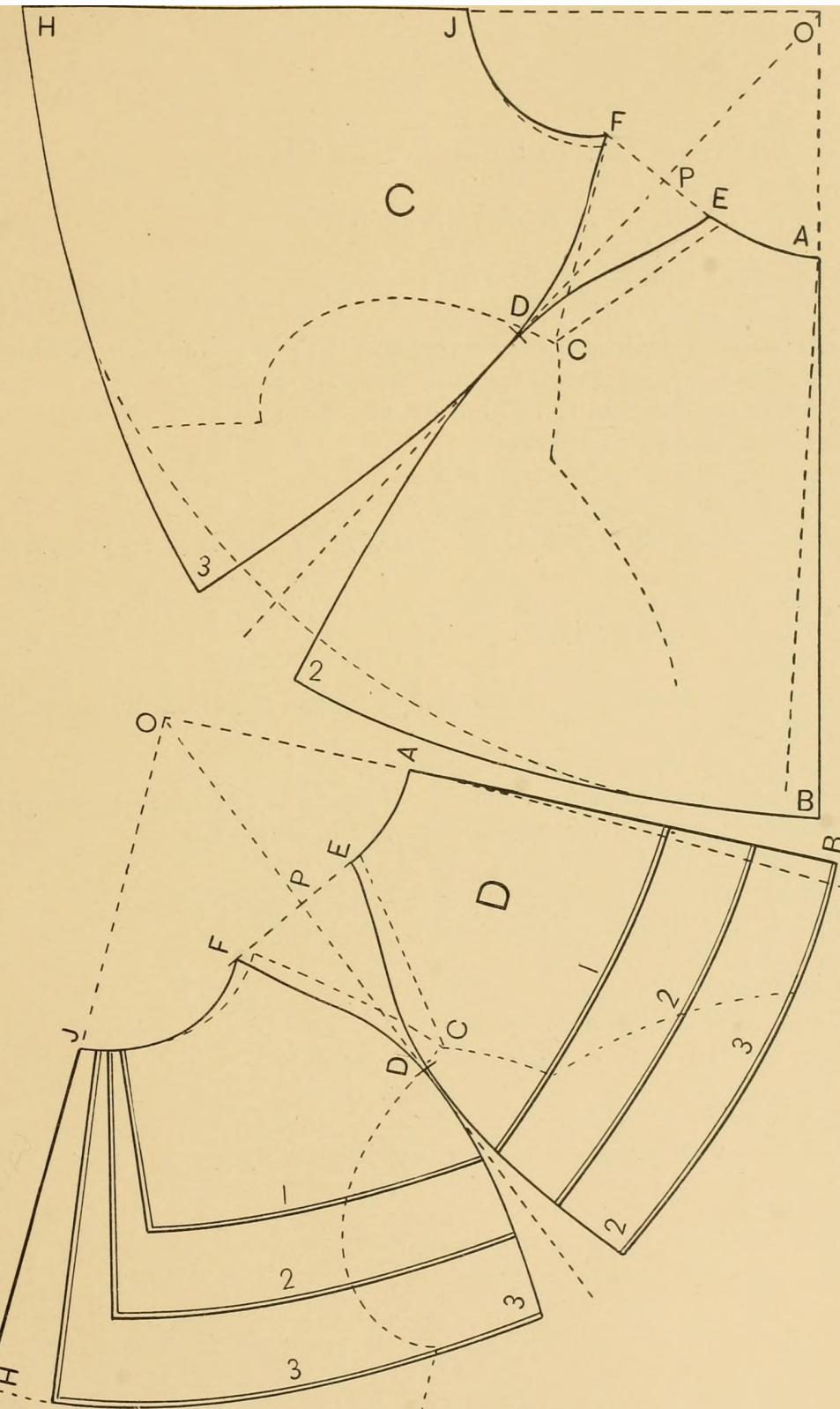
Jung et. al.

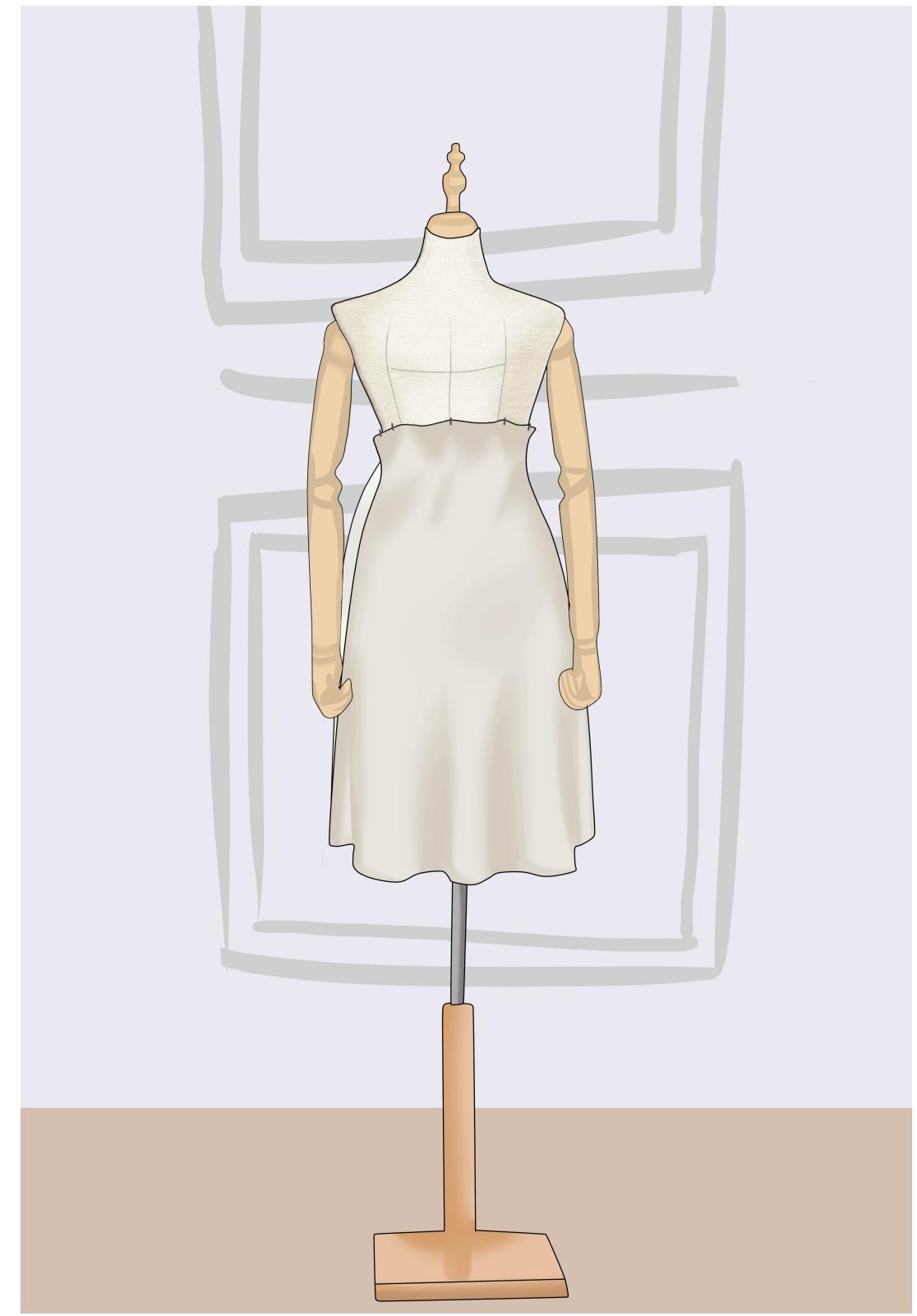
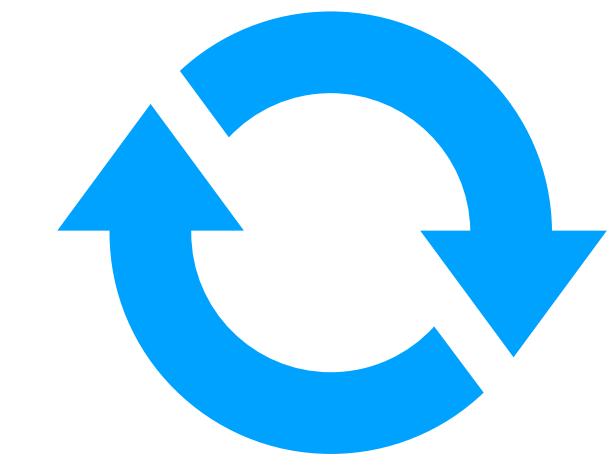
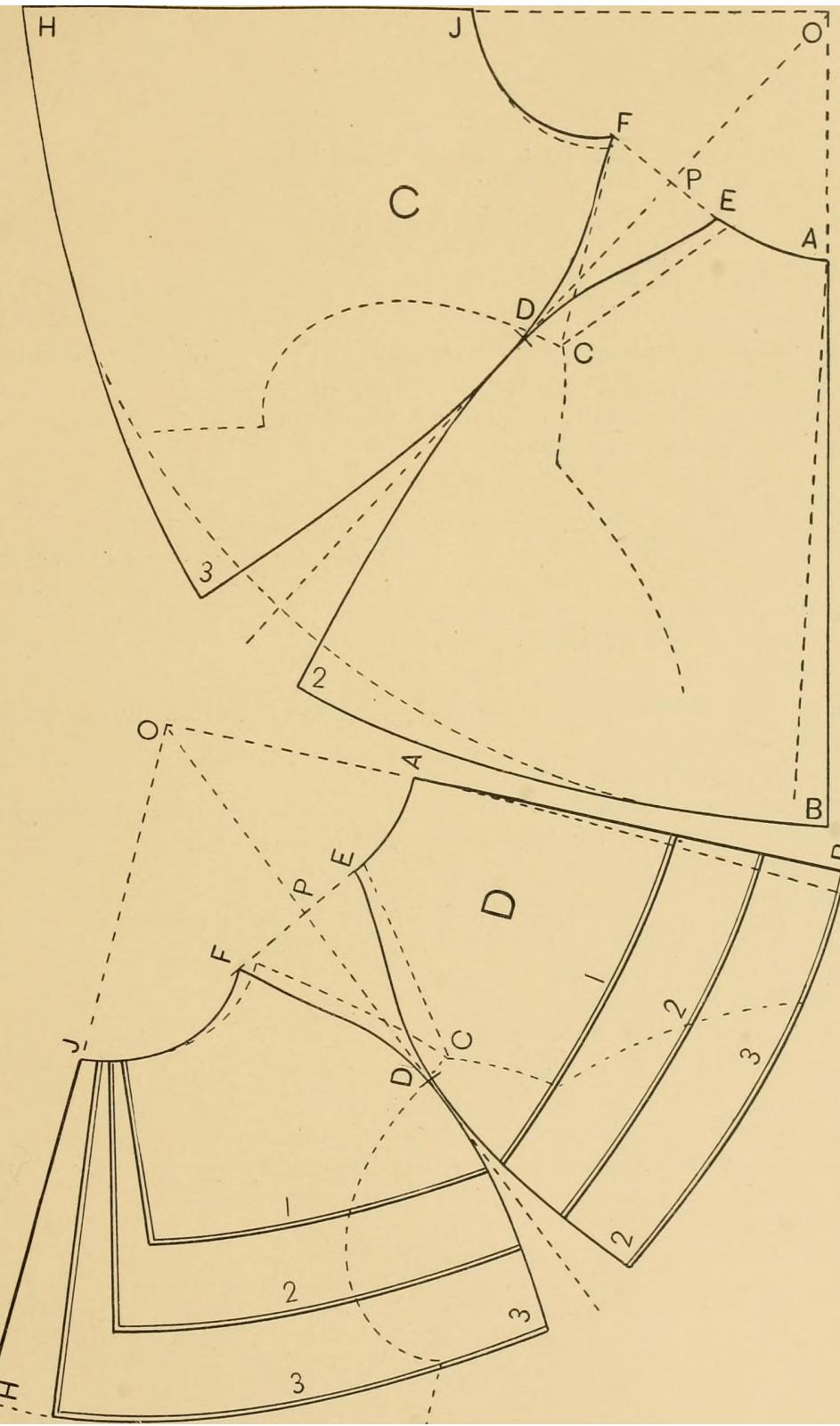
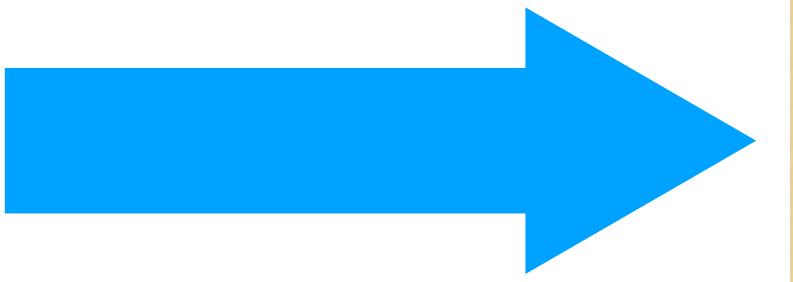
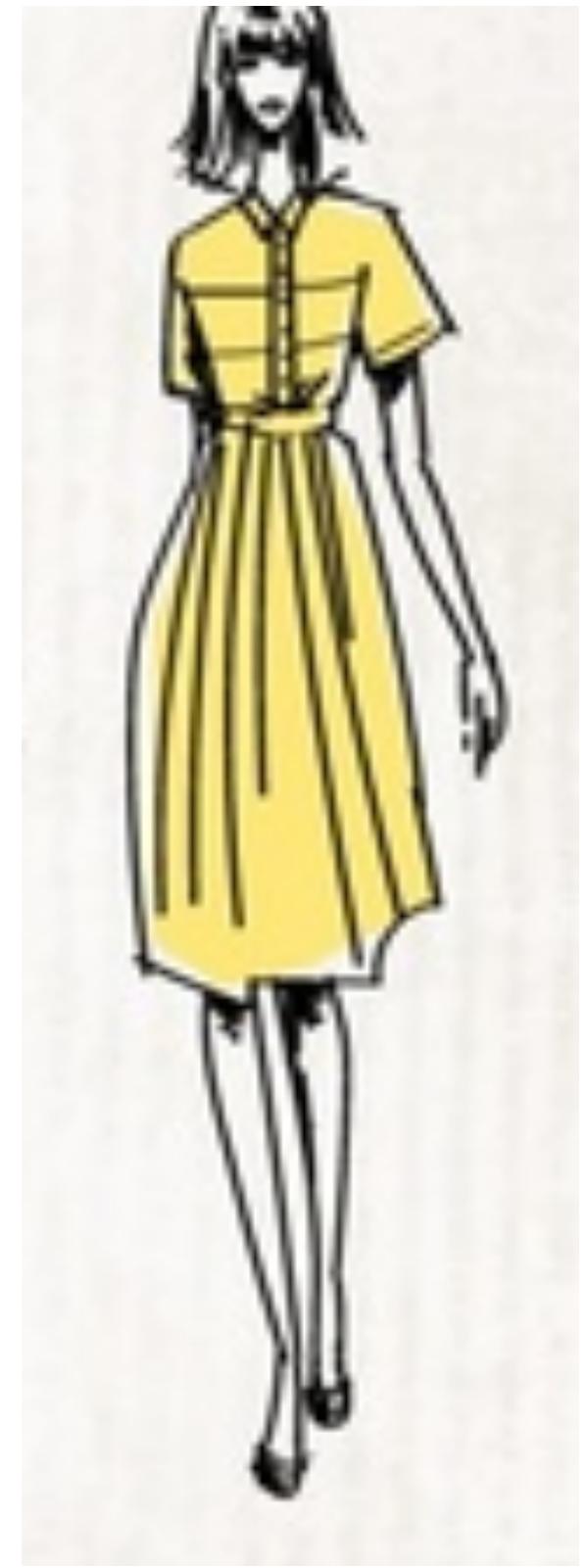


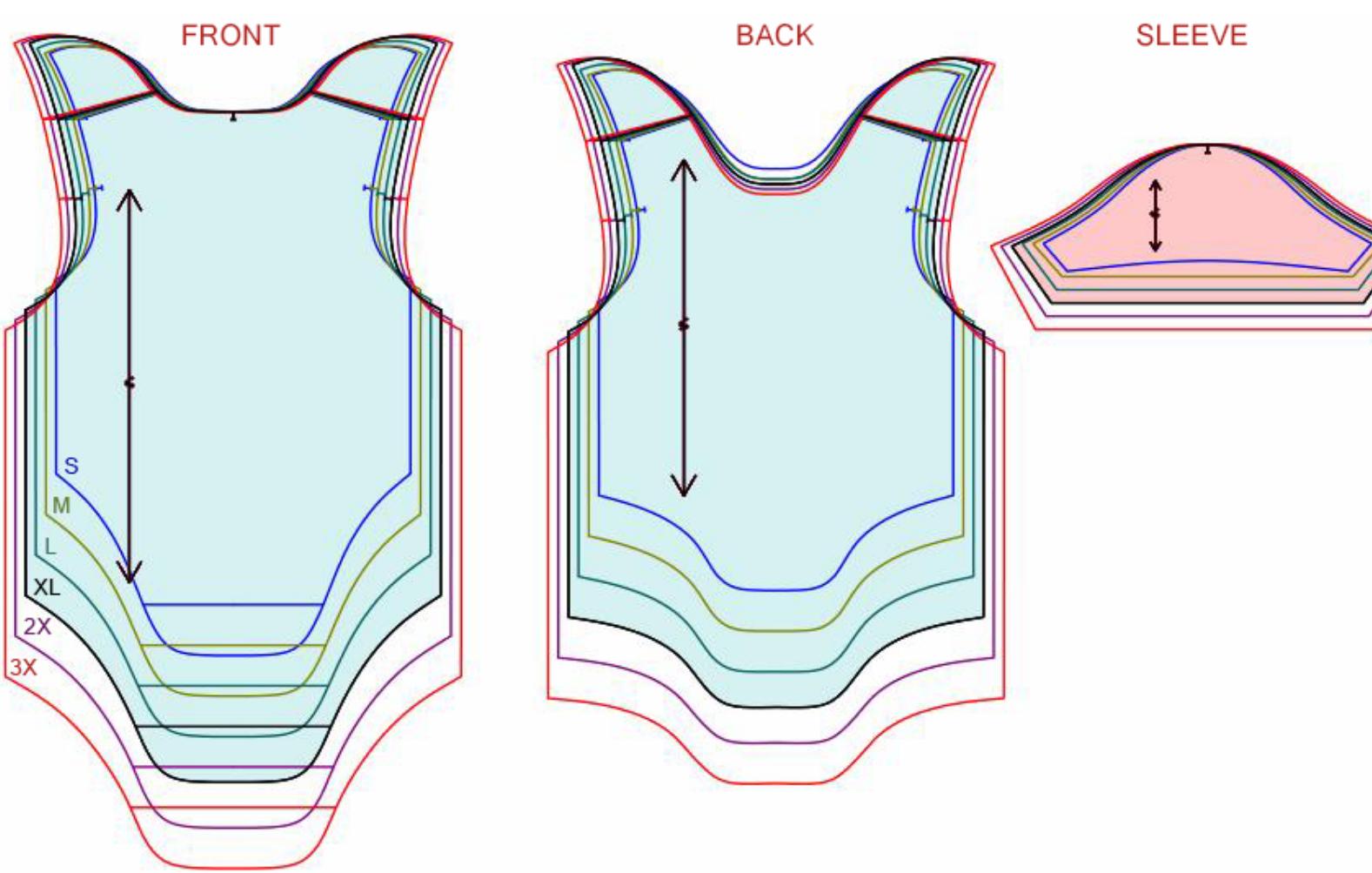
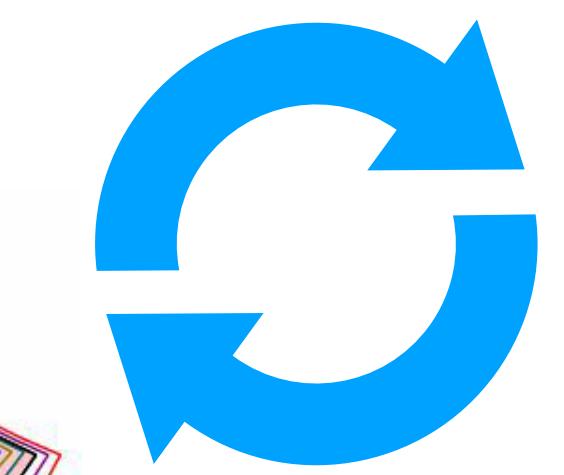
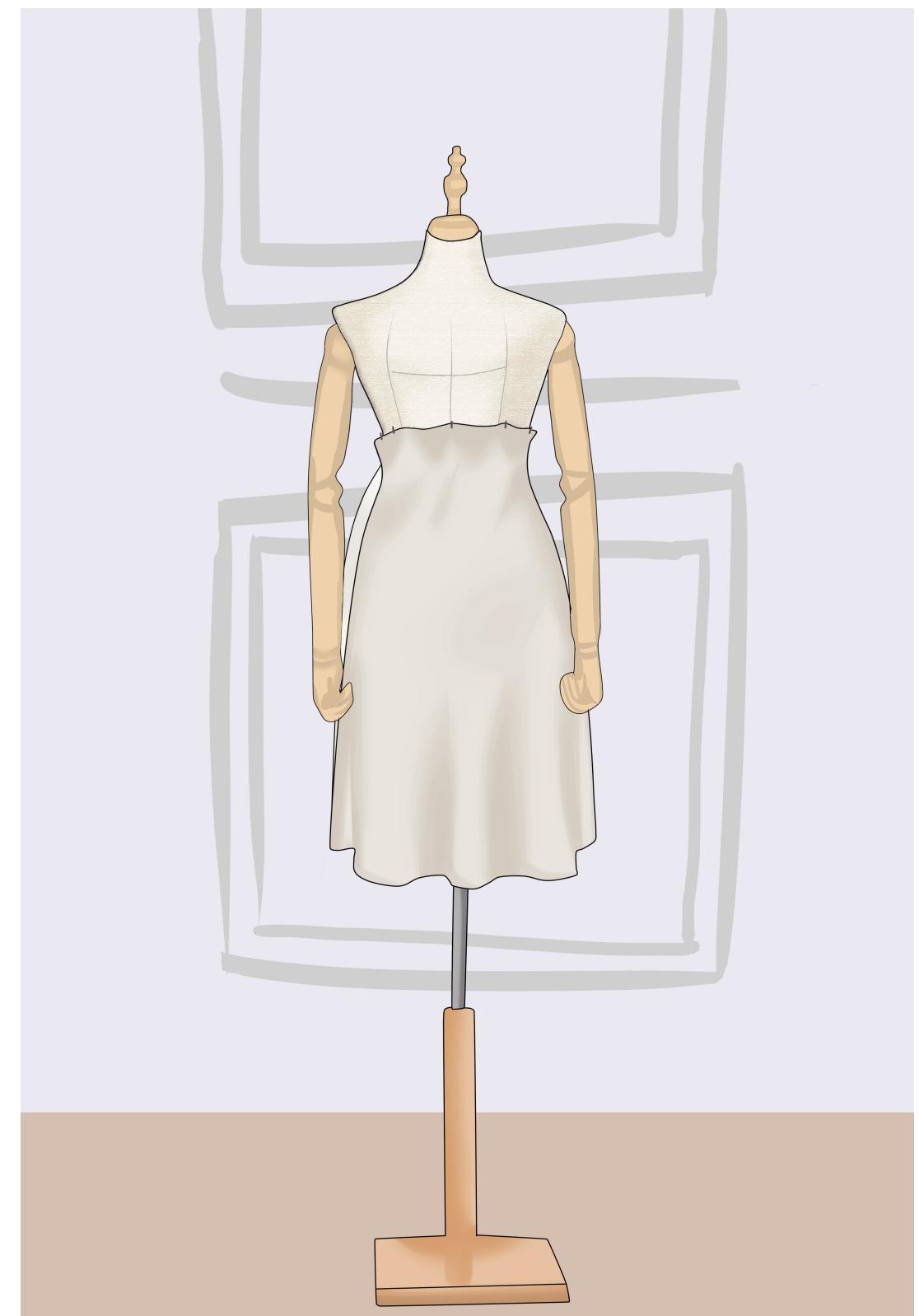
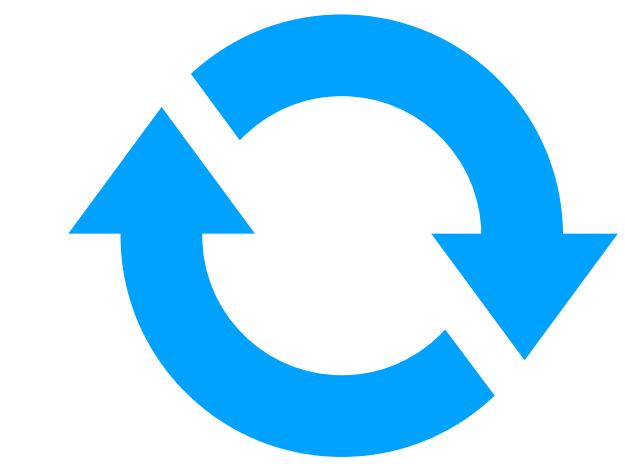
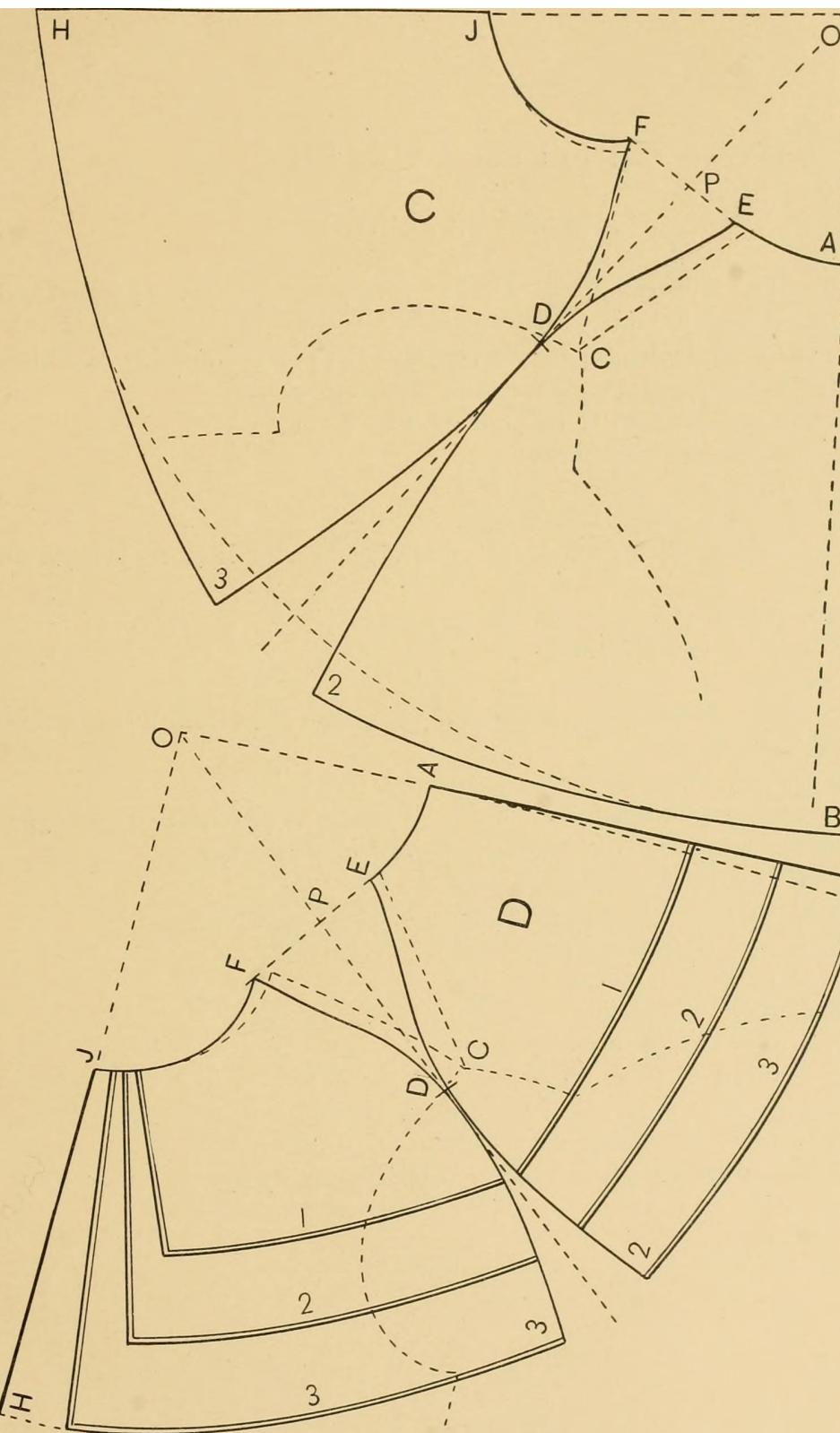
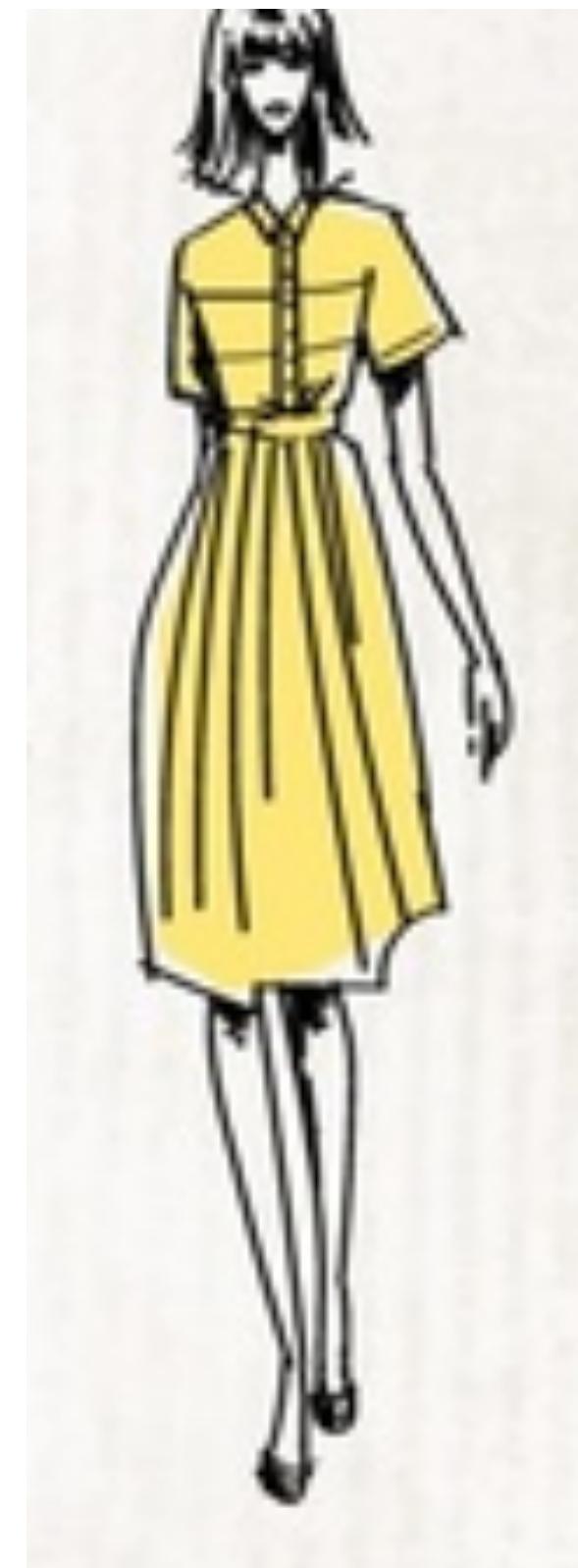
Bartle et. al. 2017

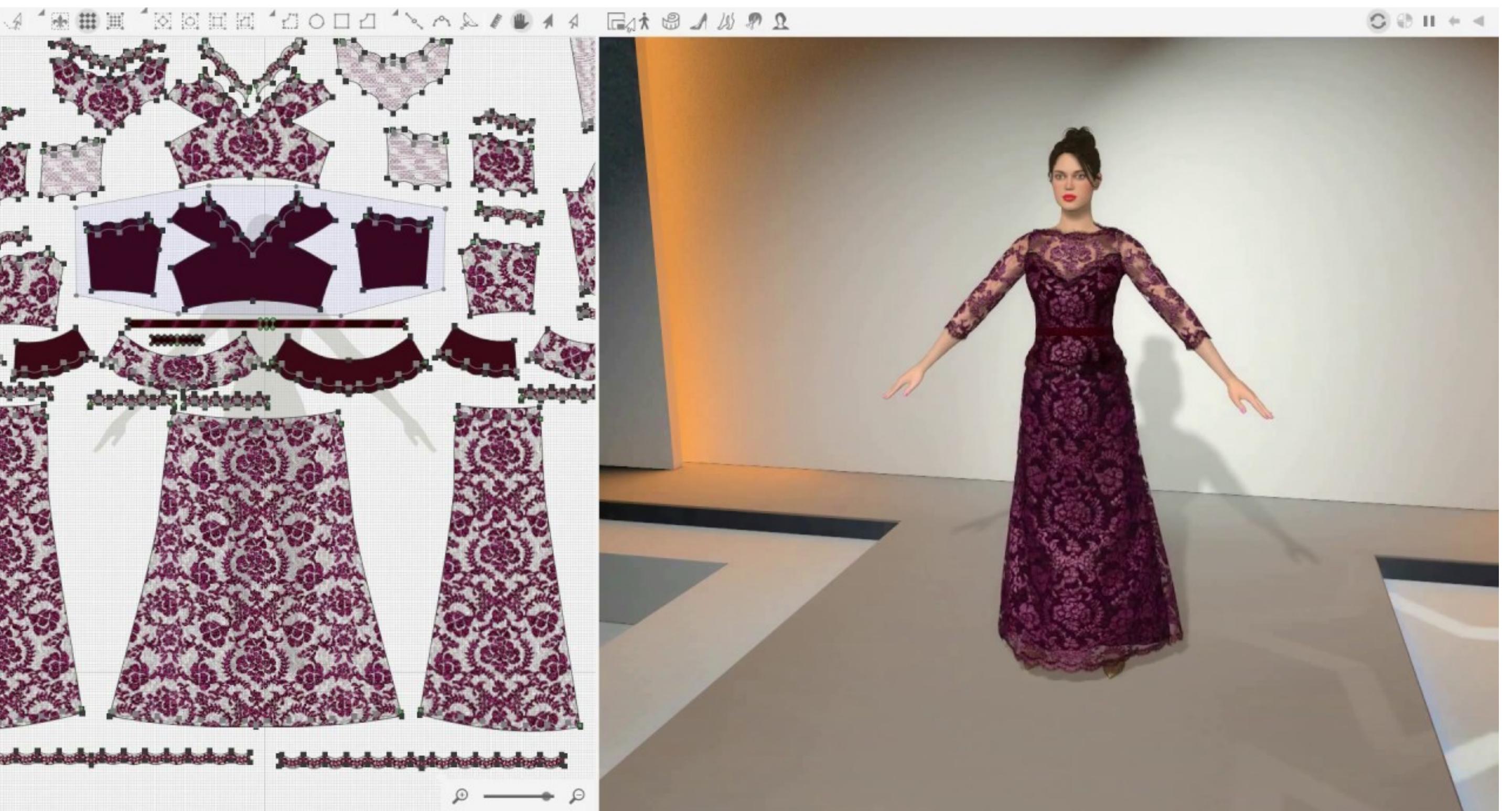












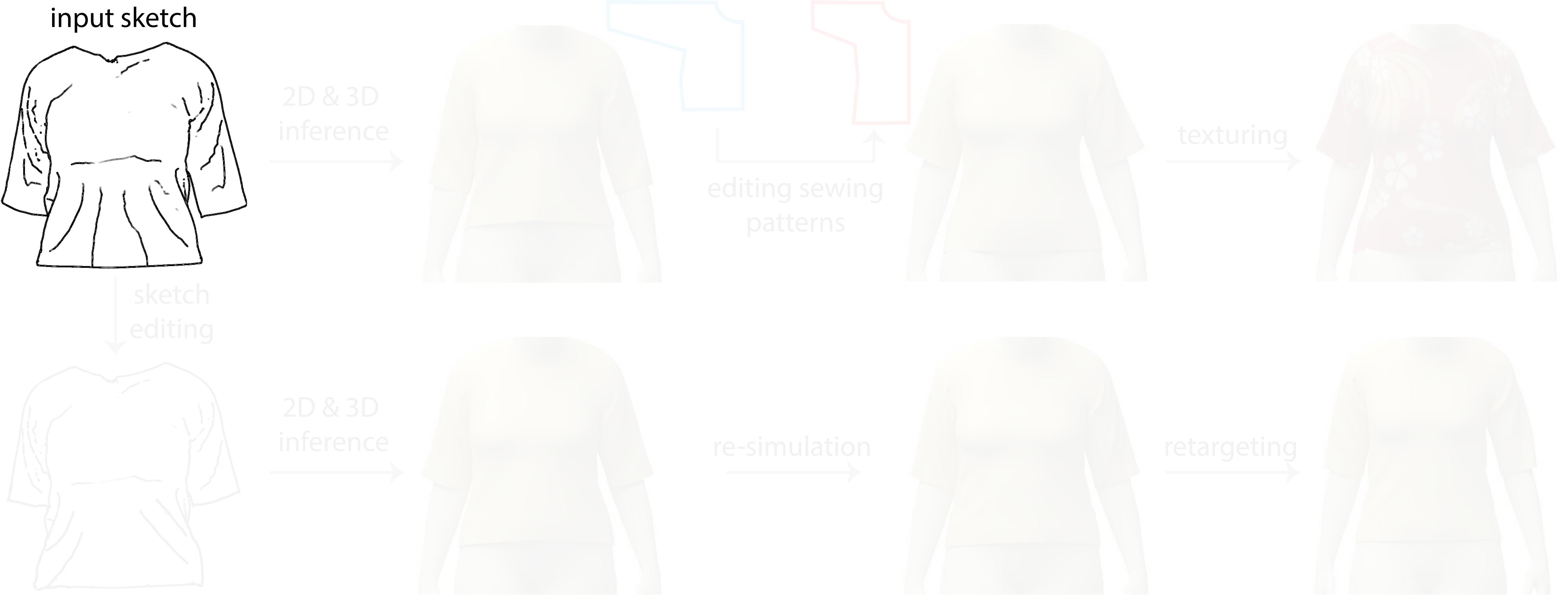


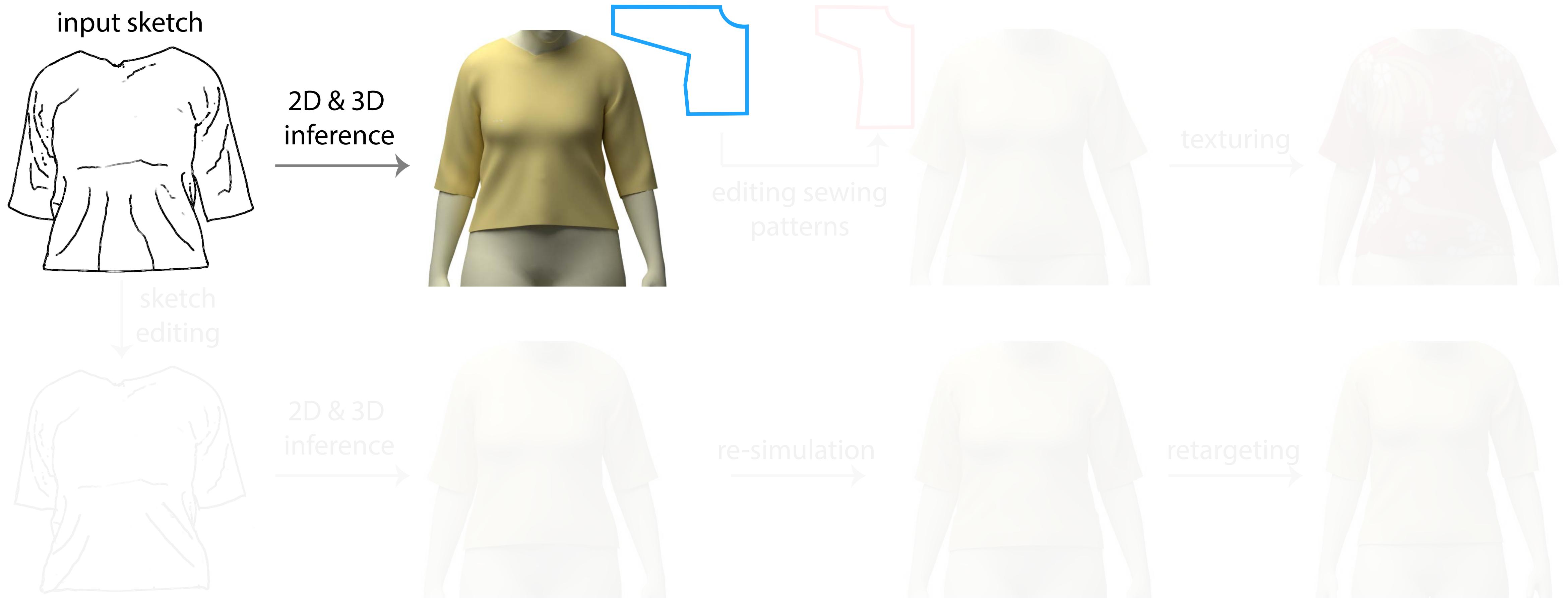
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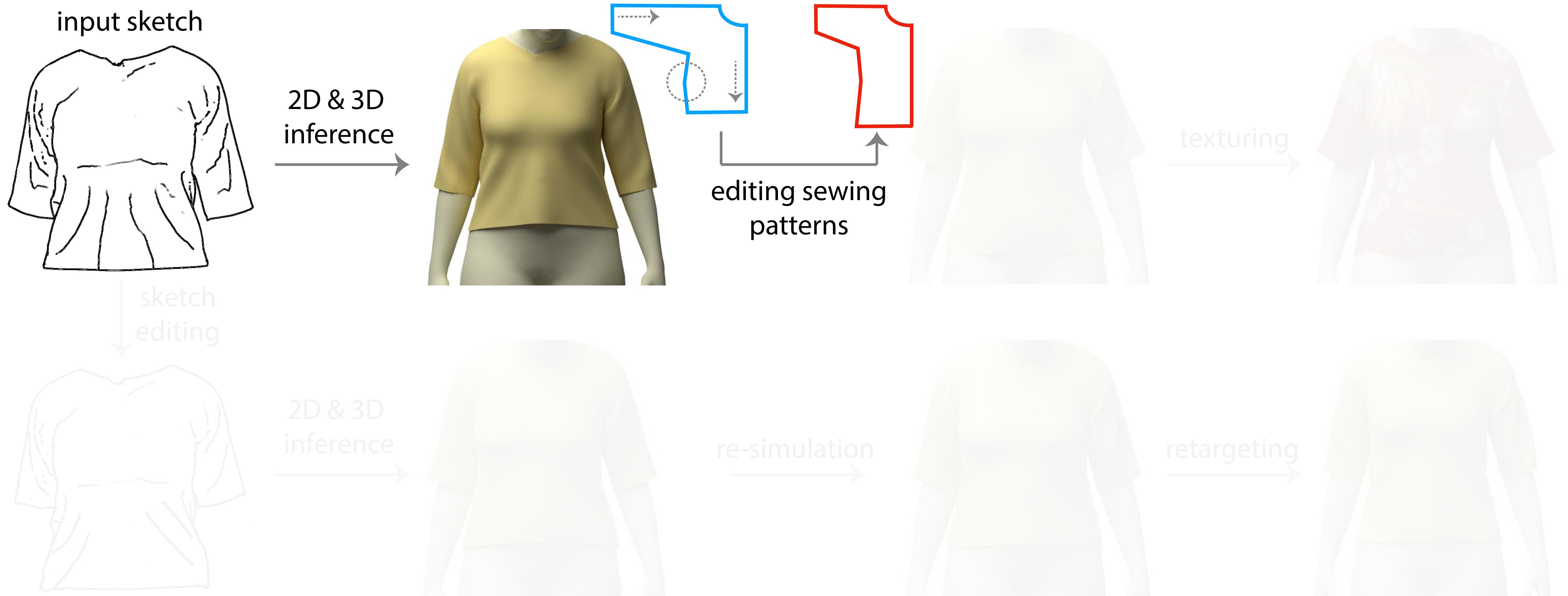
Style 衬衫短袖

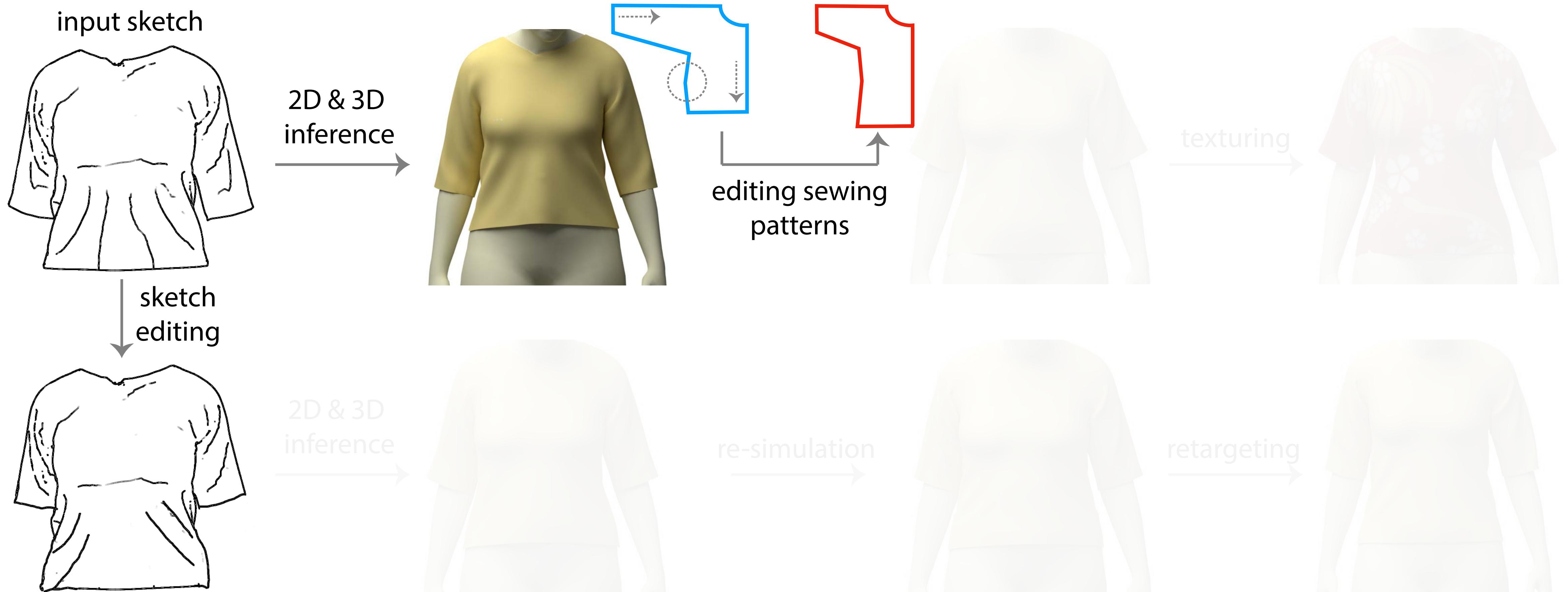
Size 1

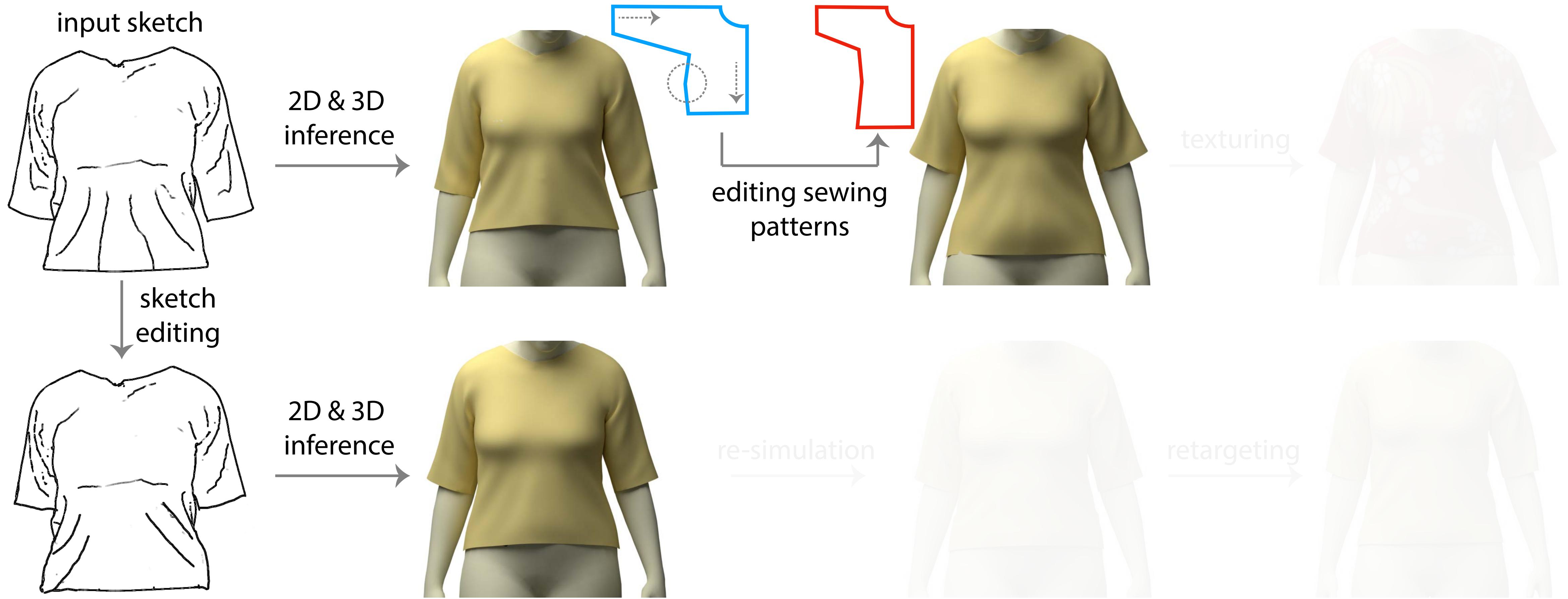
	M	L
衣长	74	75
胸围	108	108
腰围	102	102
摆围	104	104
肩宽	45.5	45.5
腰节	42	42
袖长	22	22

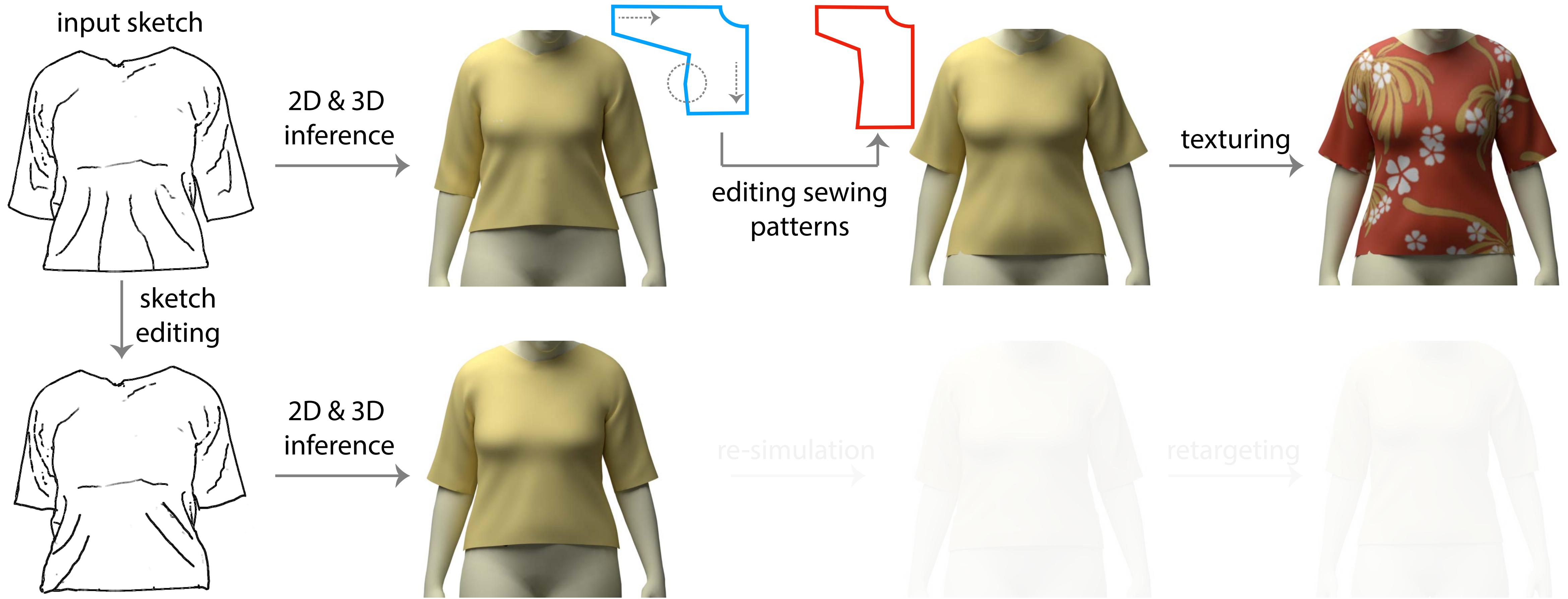


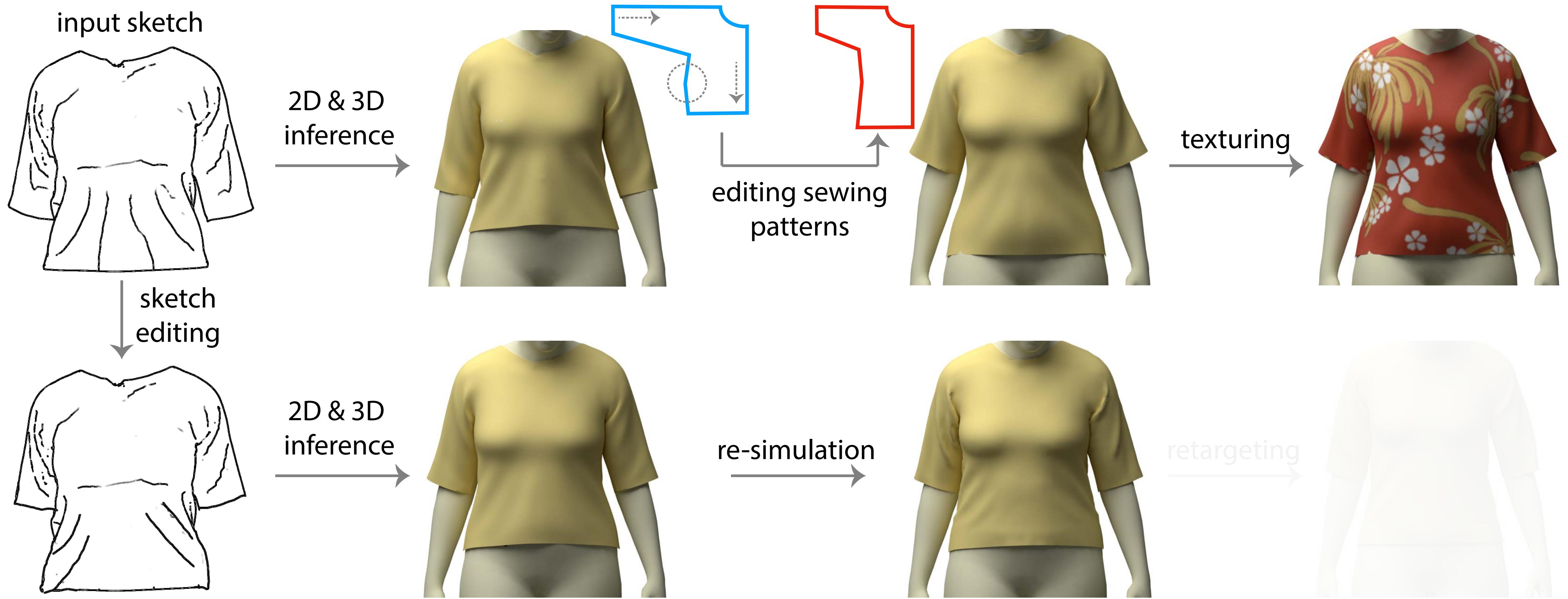


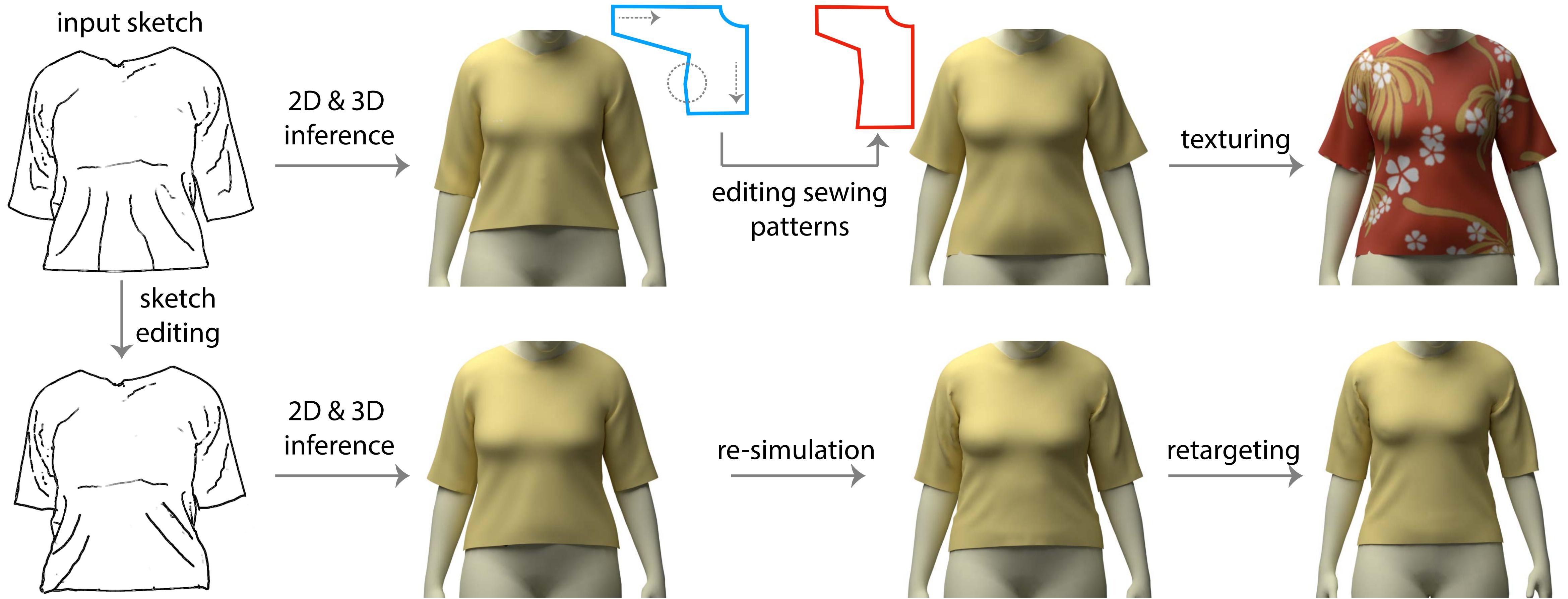






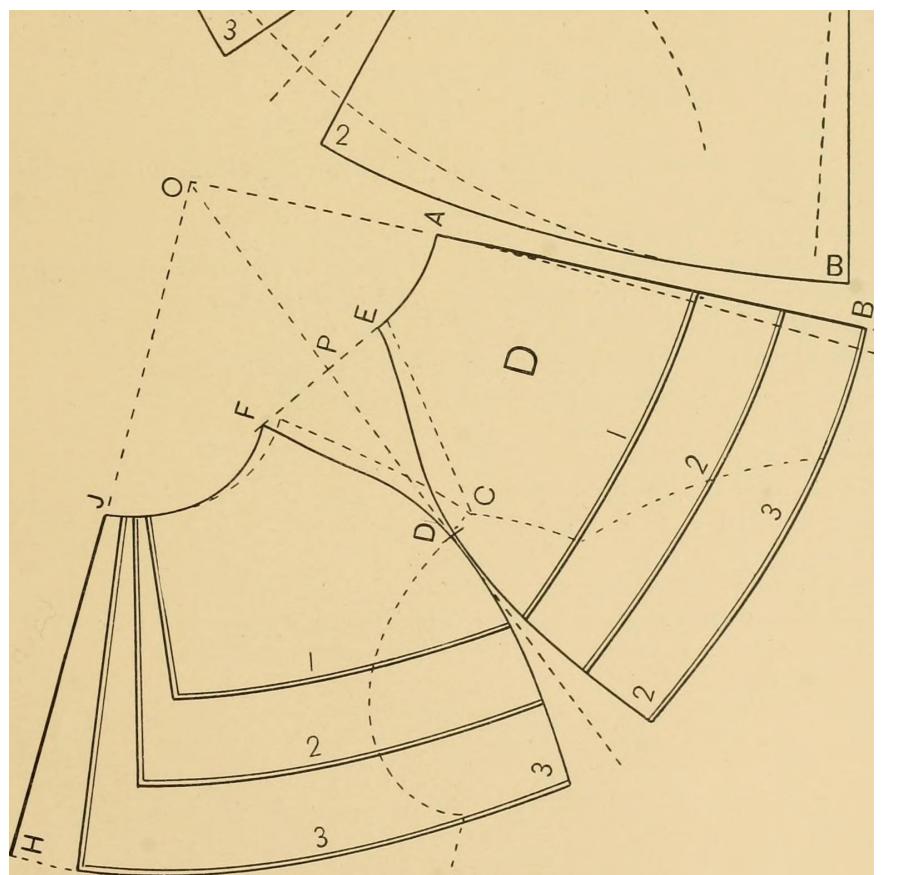
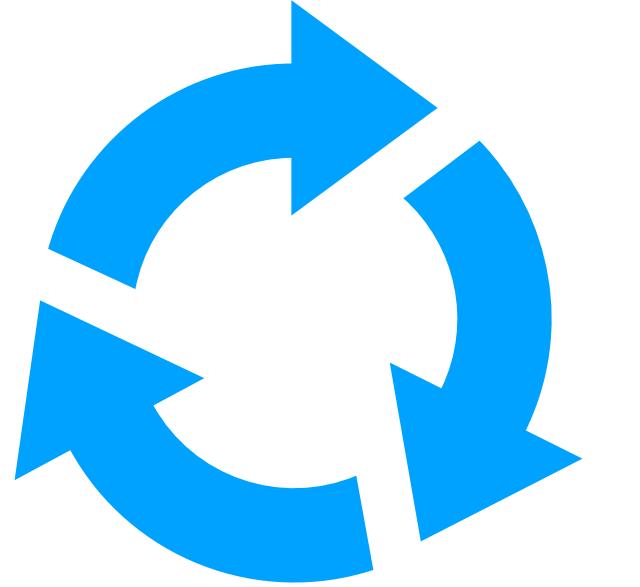




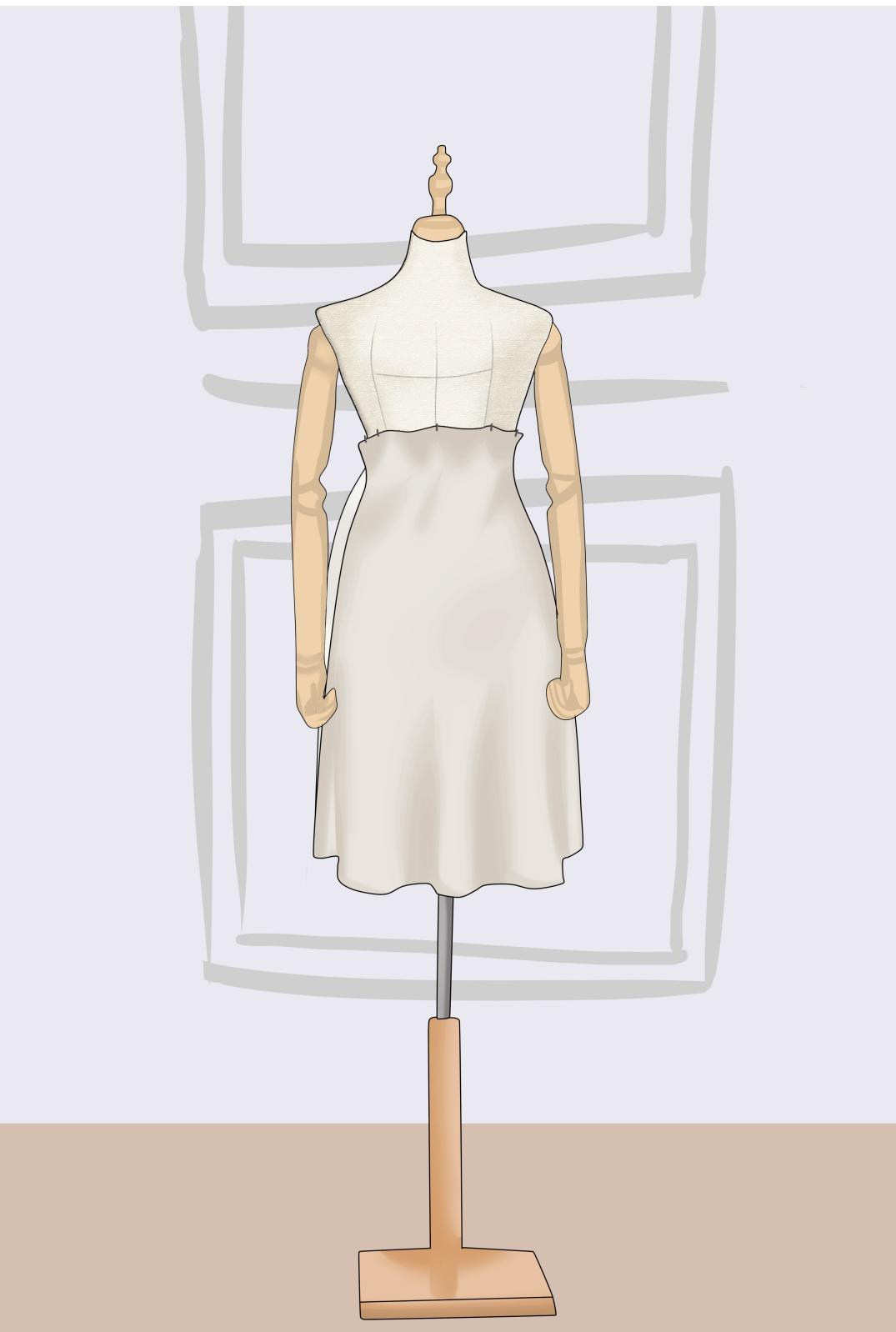




2D Sketch



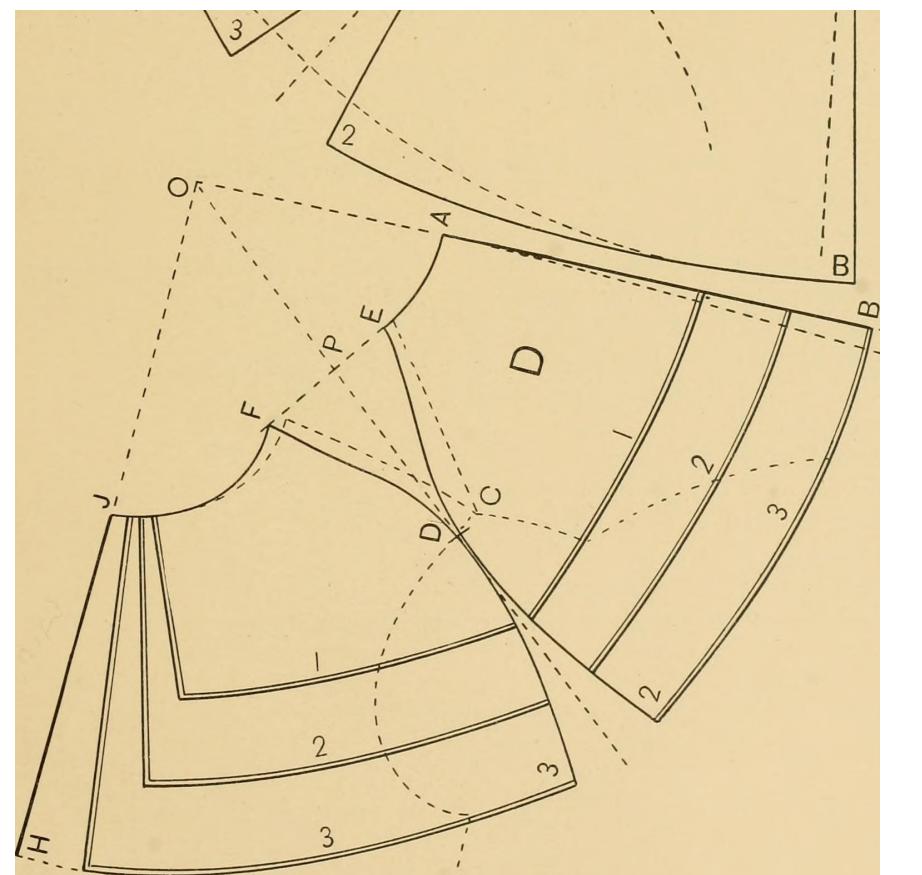
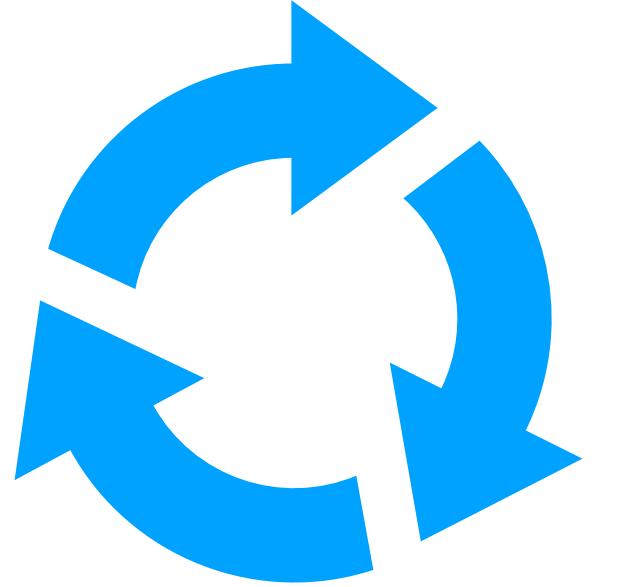
Sewing pattern



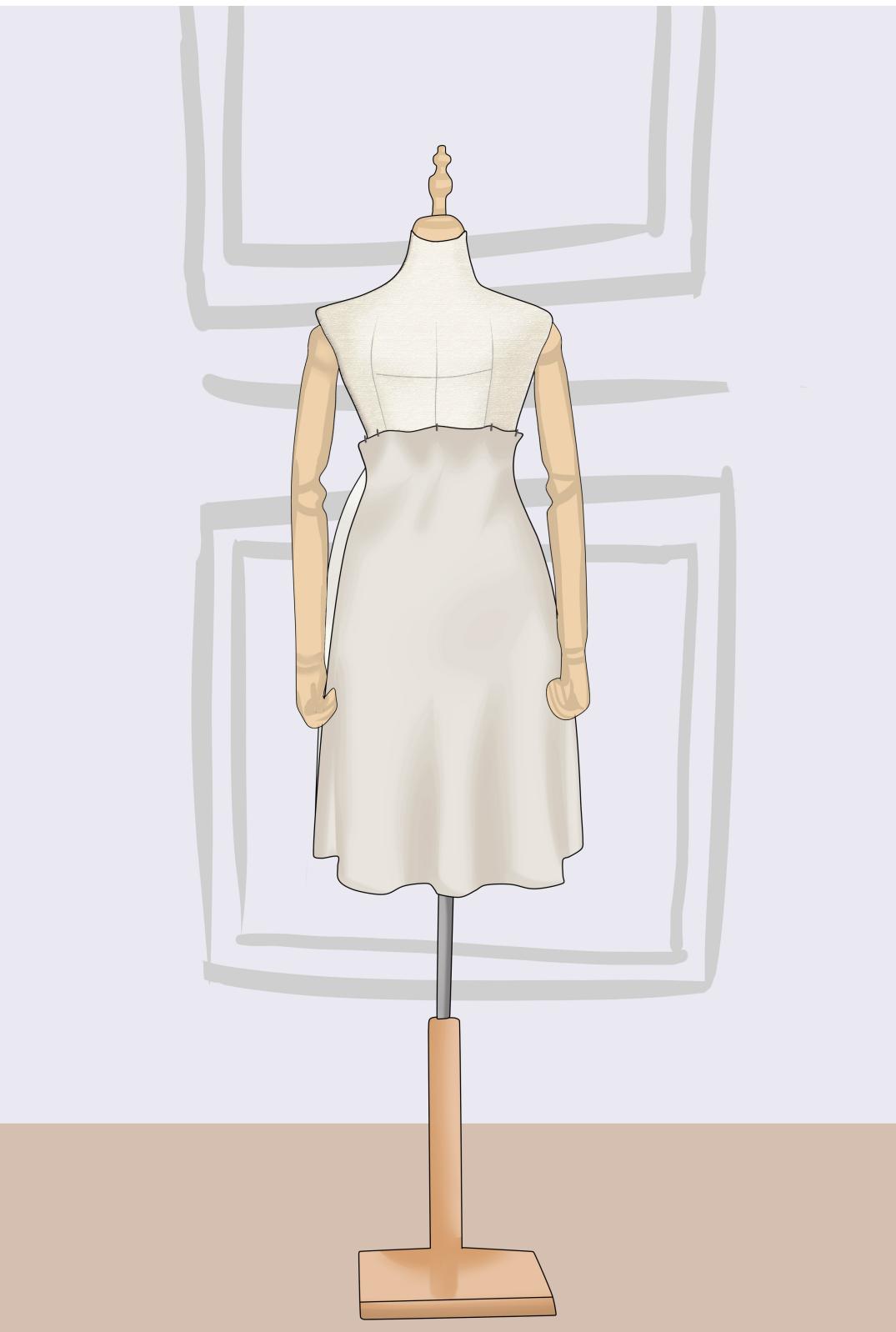
3D shape



2D Sketch



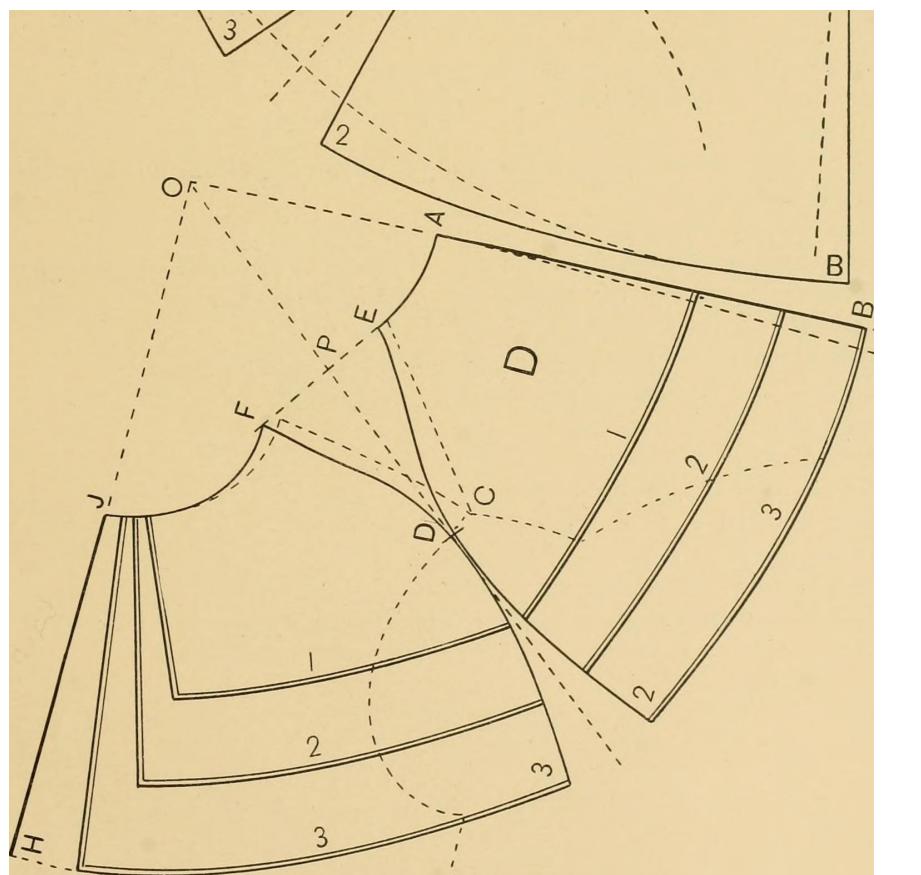
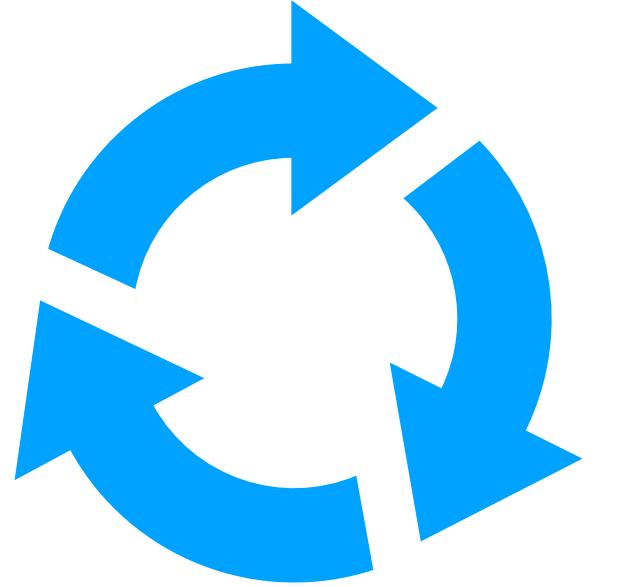
Sewing pattern



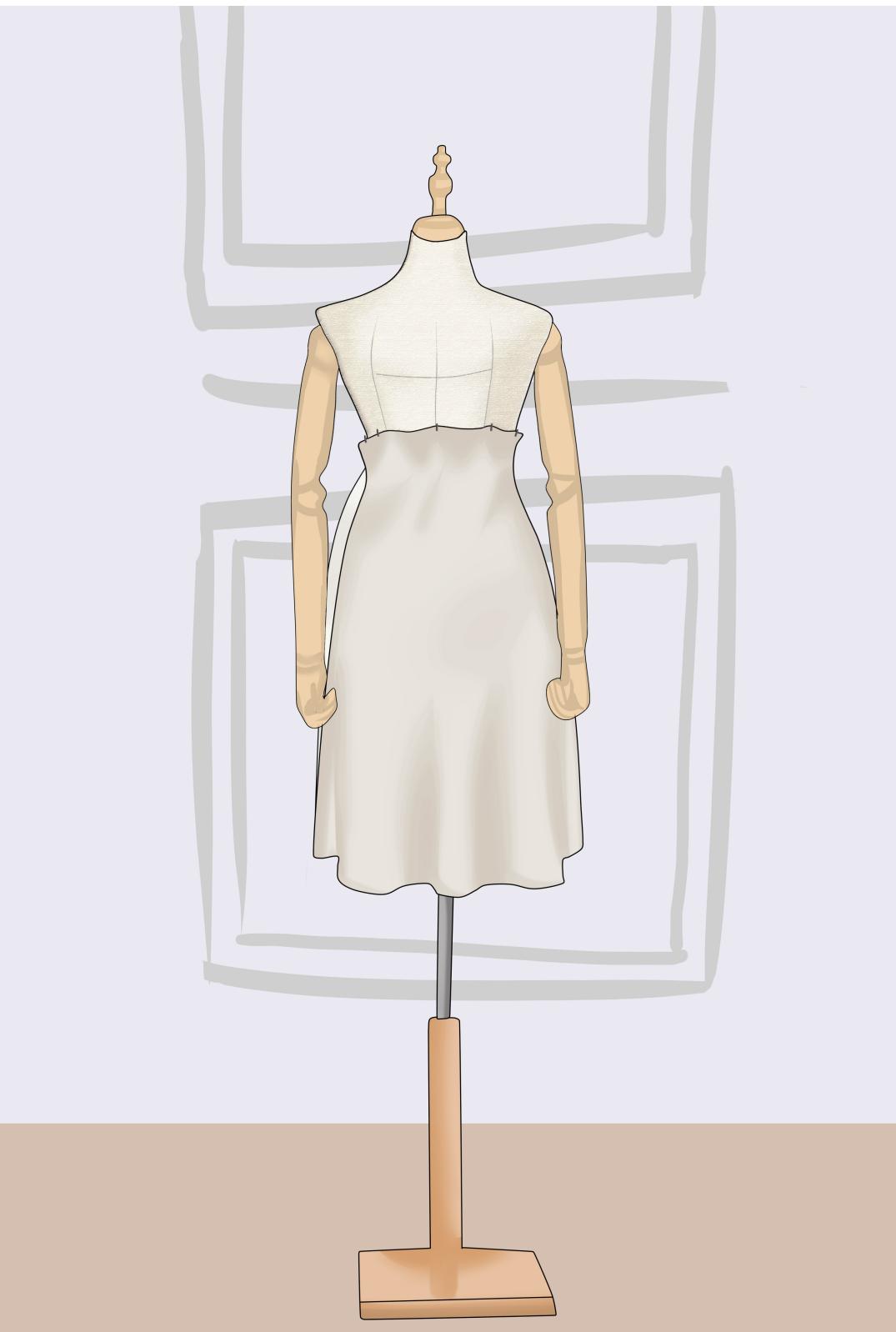
3D shape



2D Sketch



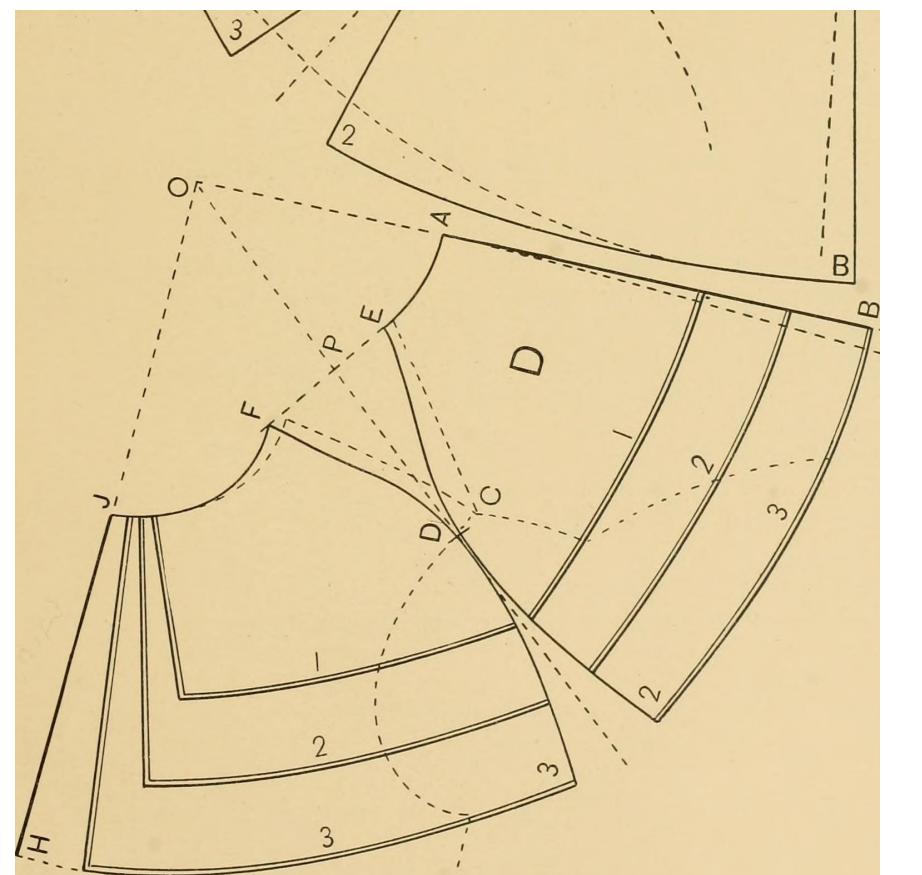
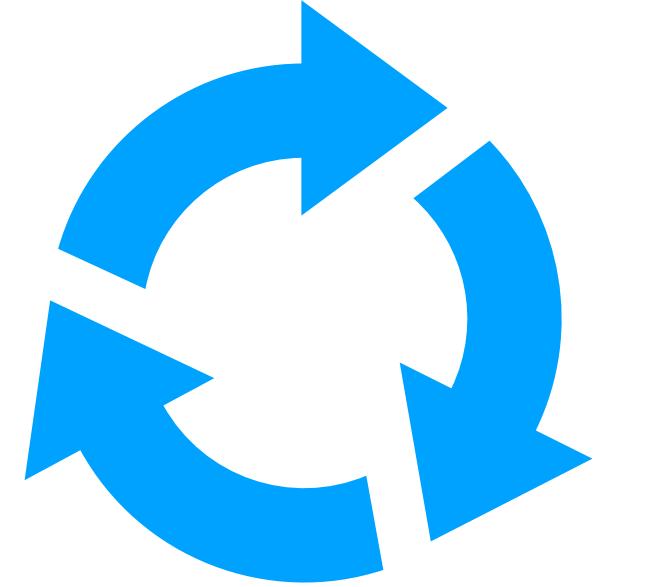
Sewing pattern



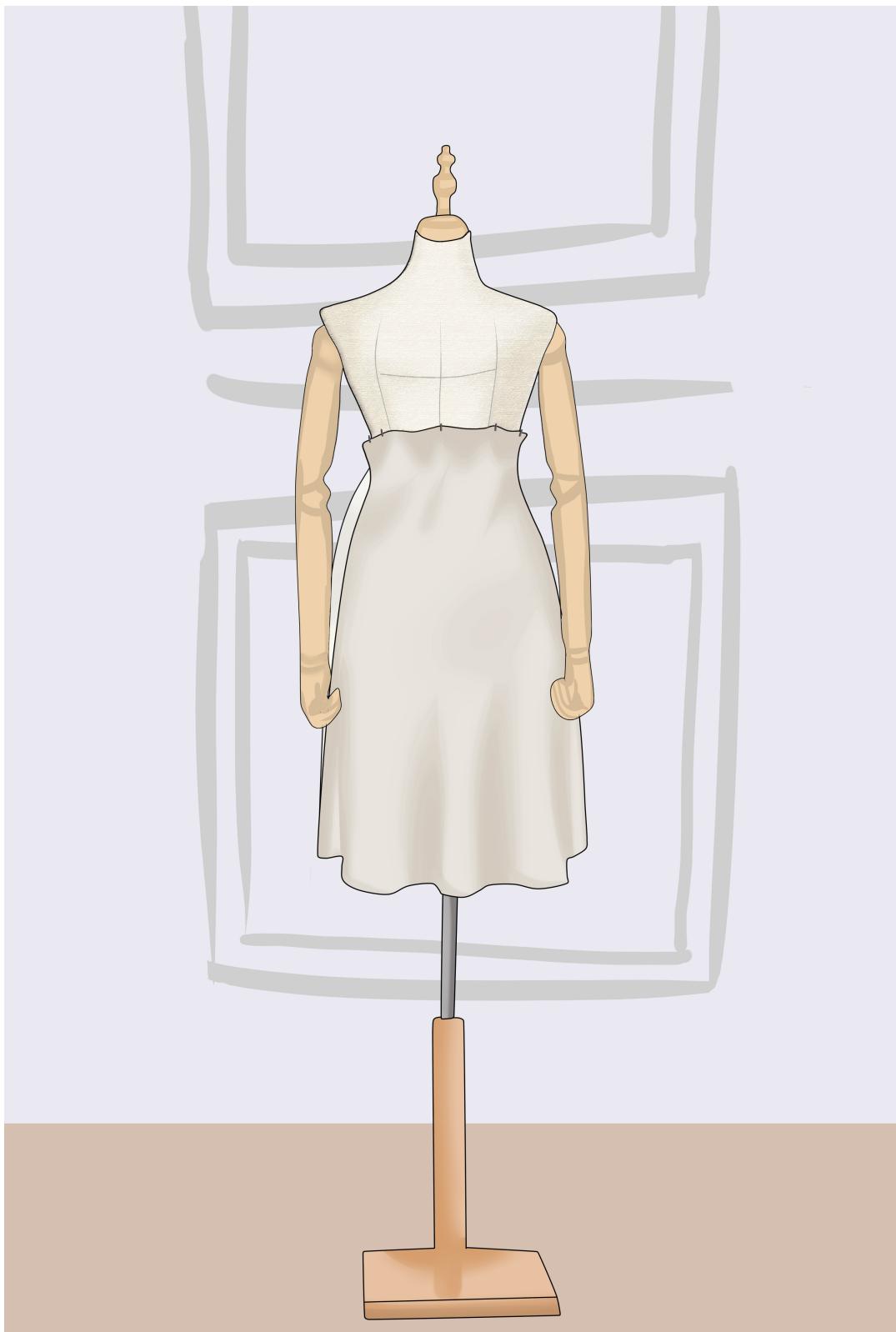
3D shape



2D Sketch



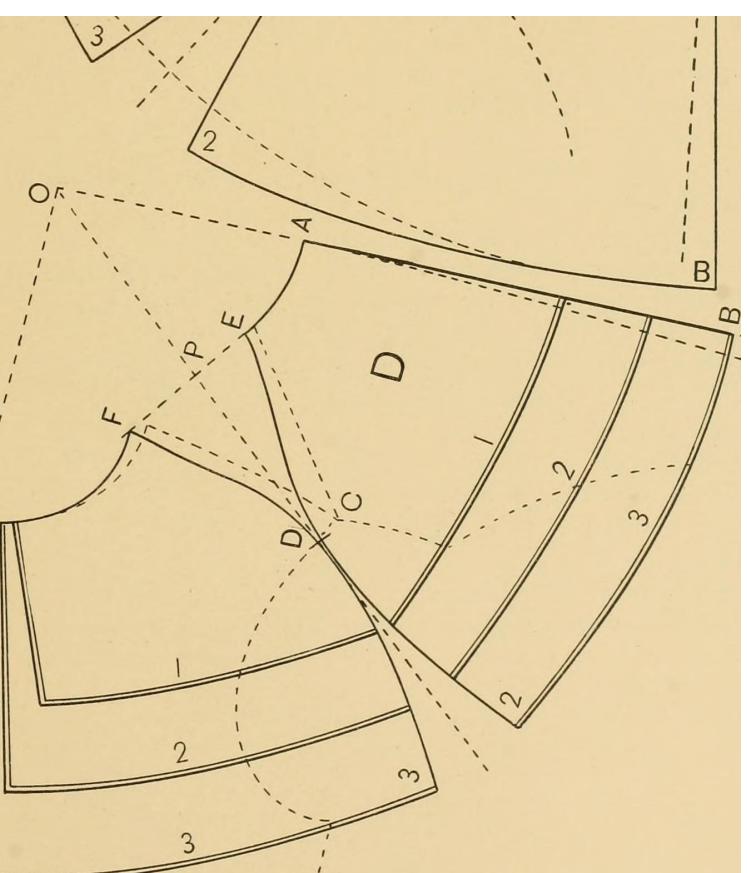
Sewing pattern



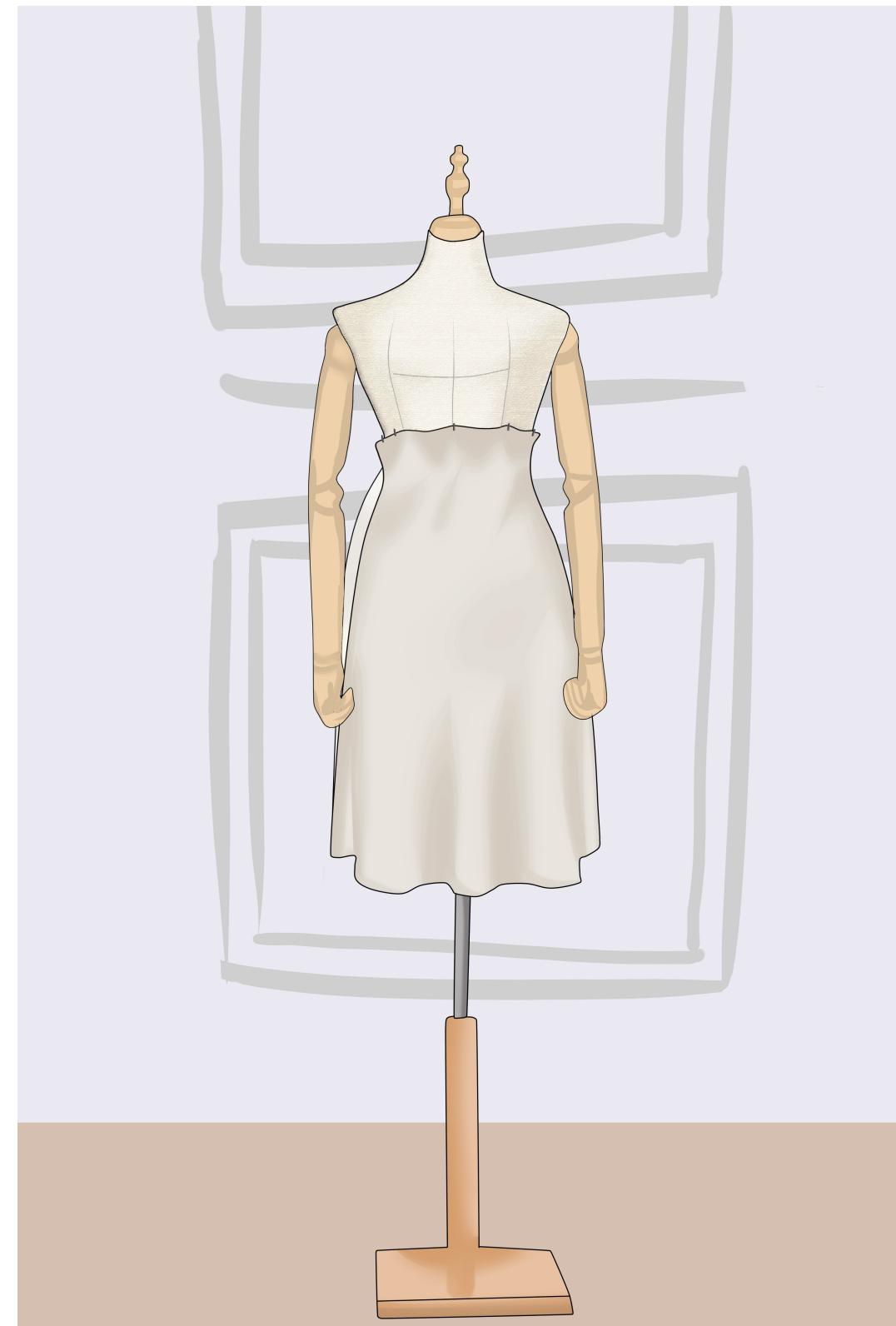
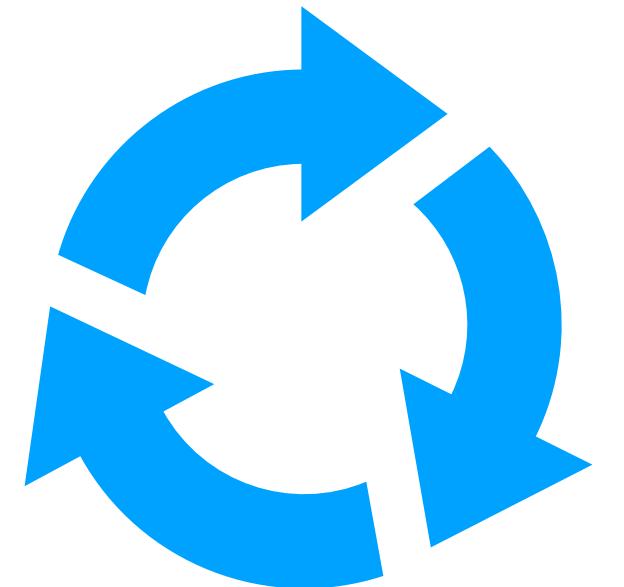
3D shape



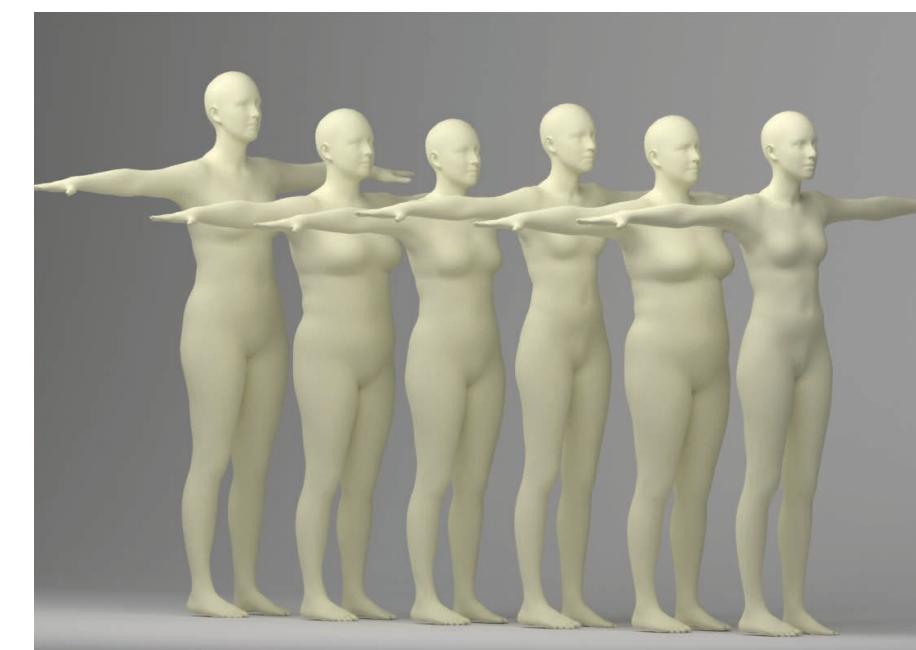
2D Sketch



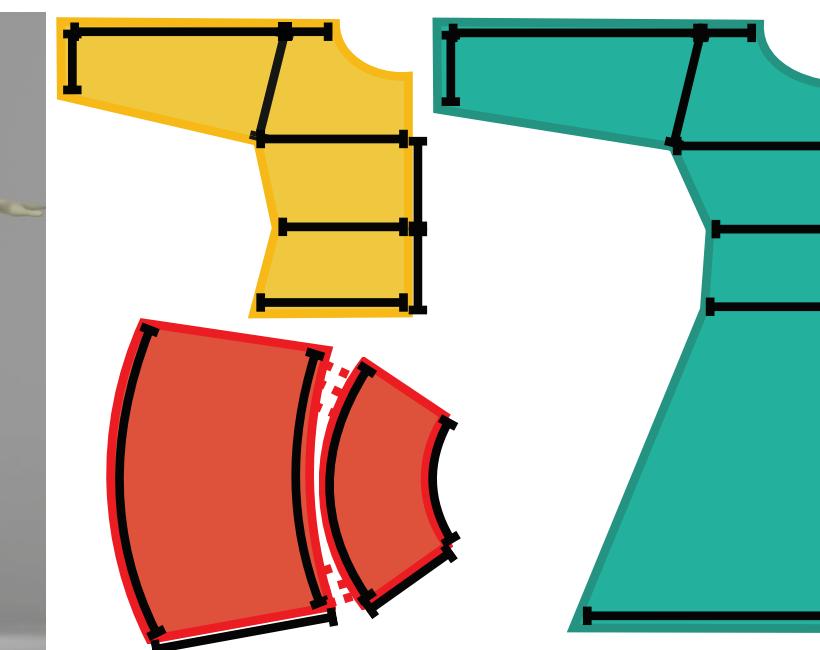
Sewing pattern



3D shape



SMPL body shapes



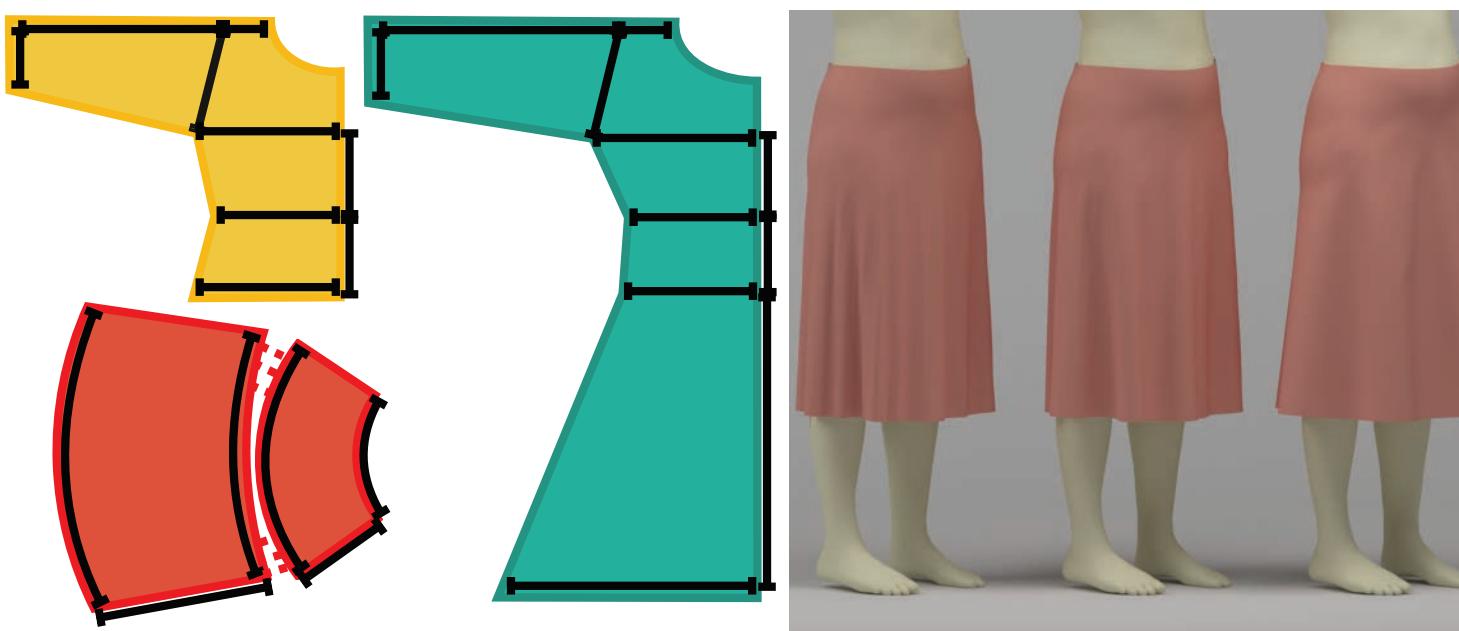
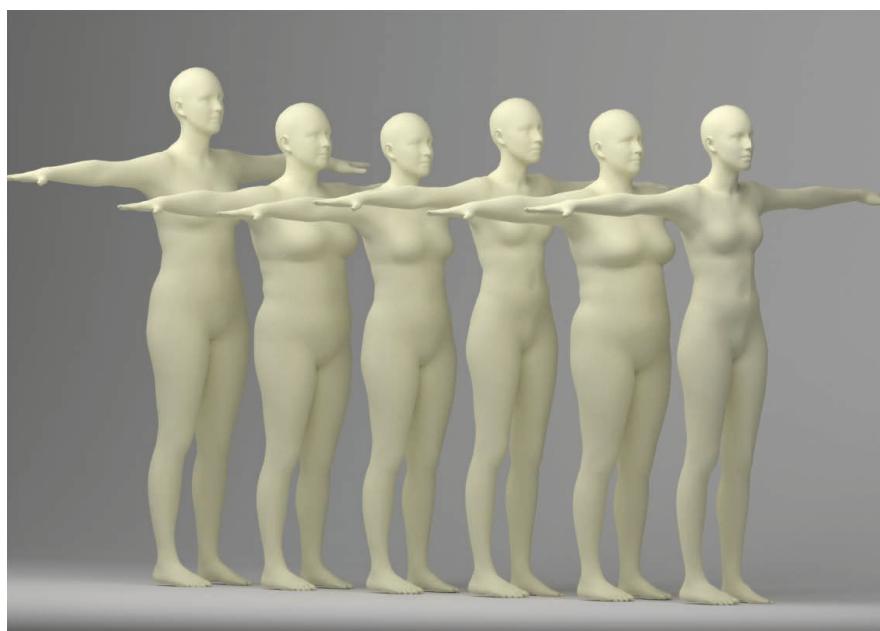
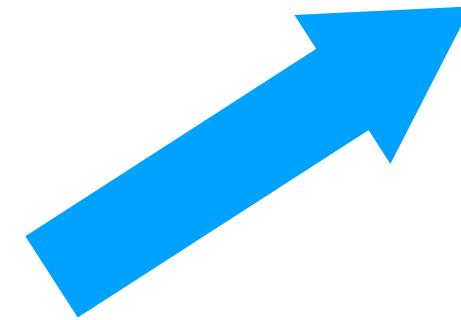
2D sewing patterns



material properties

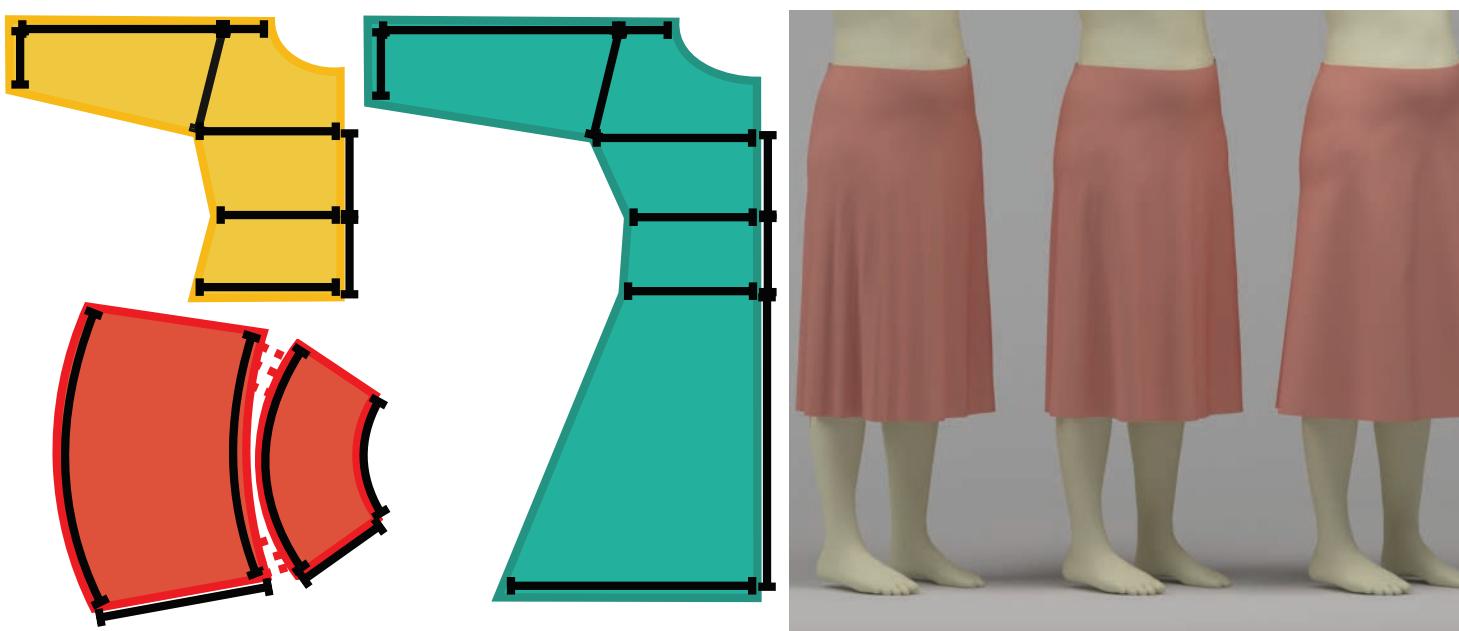
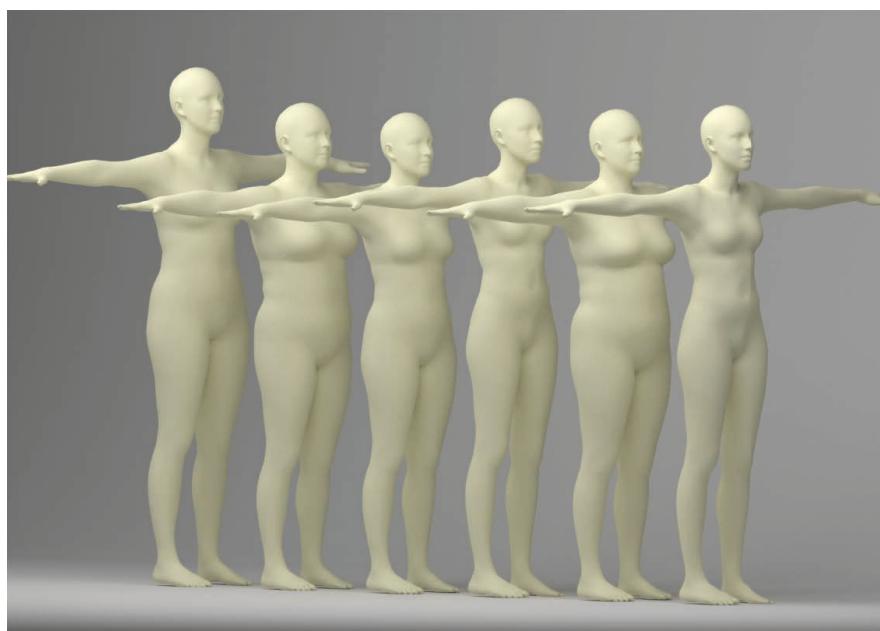
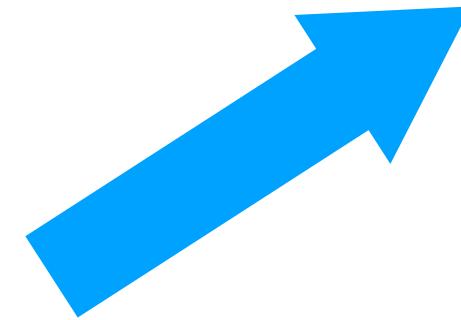


Data Driven



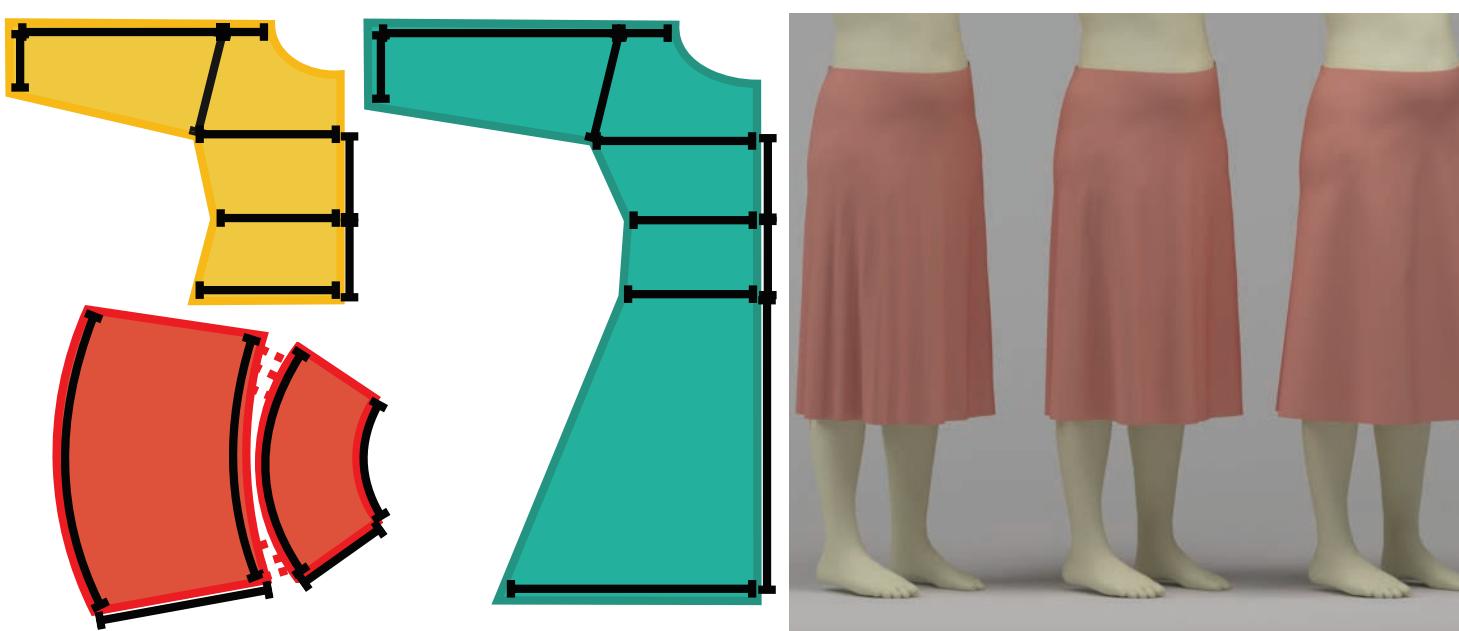
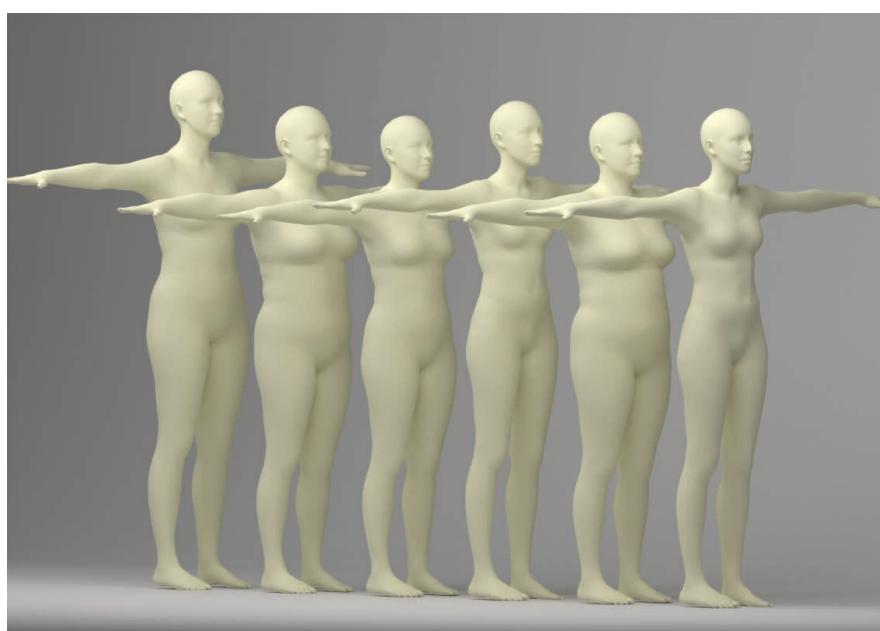
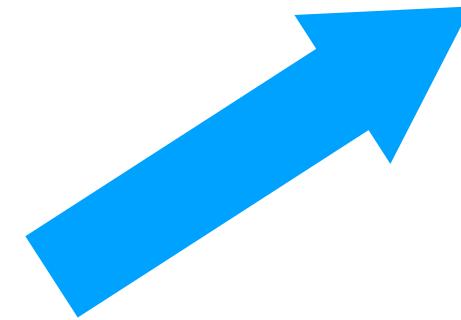


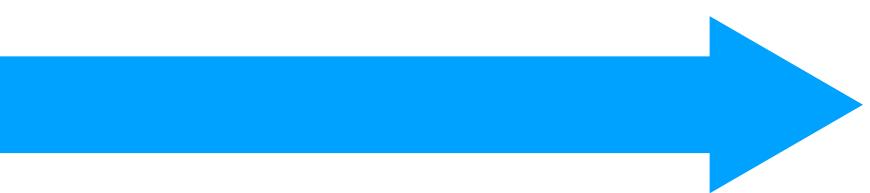
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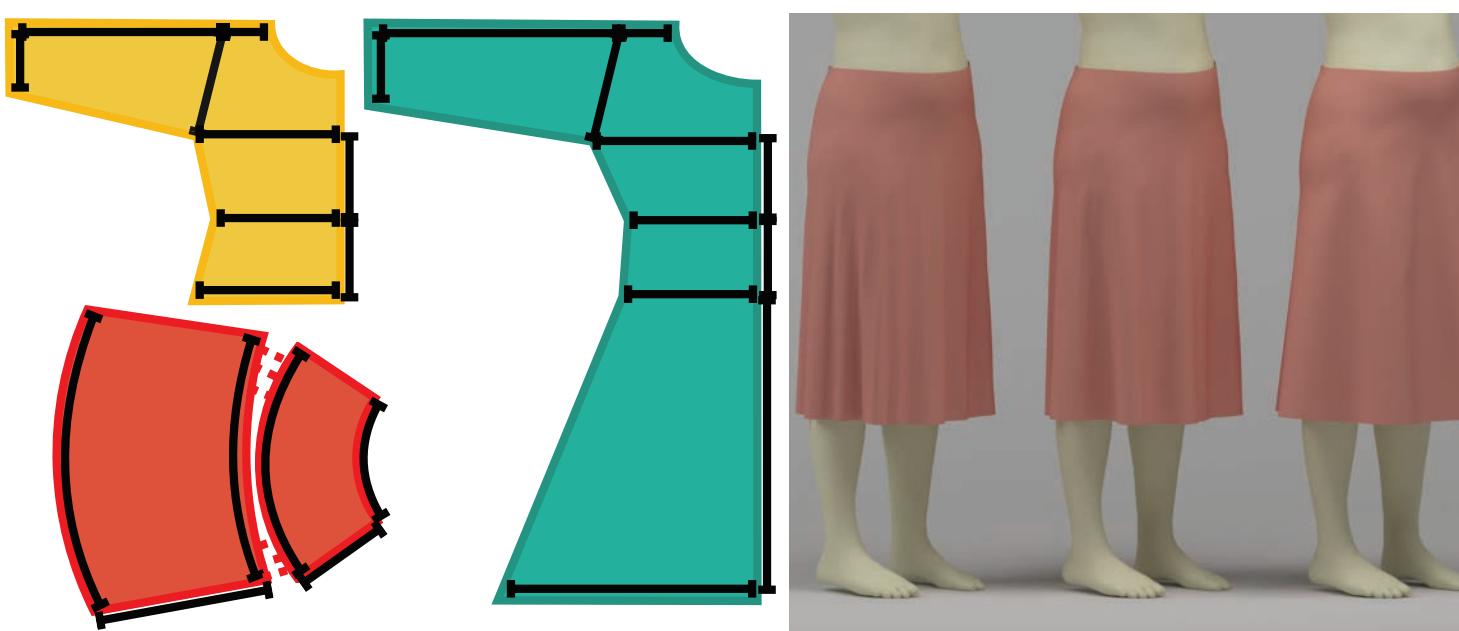
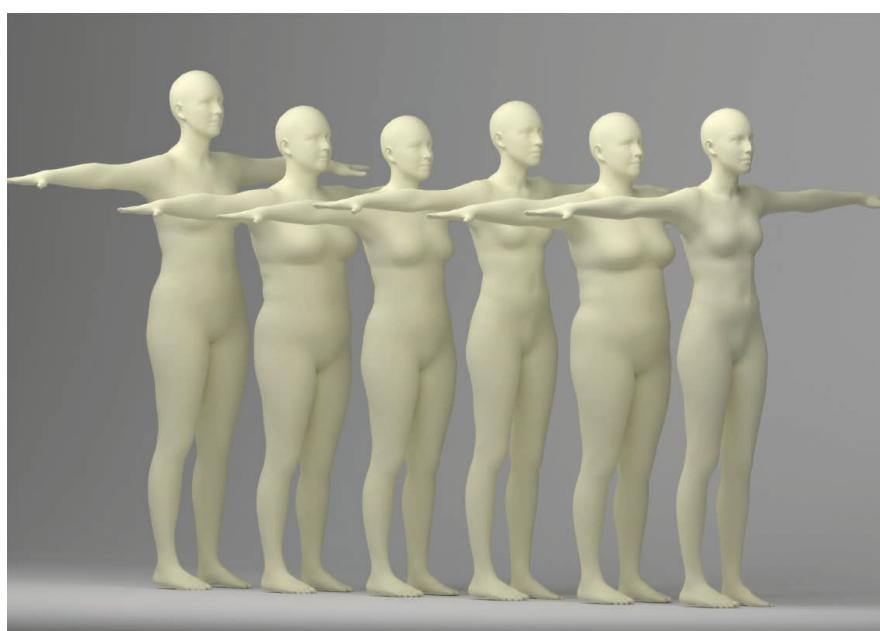
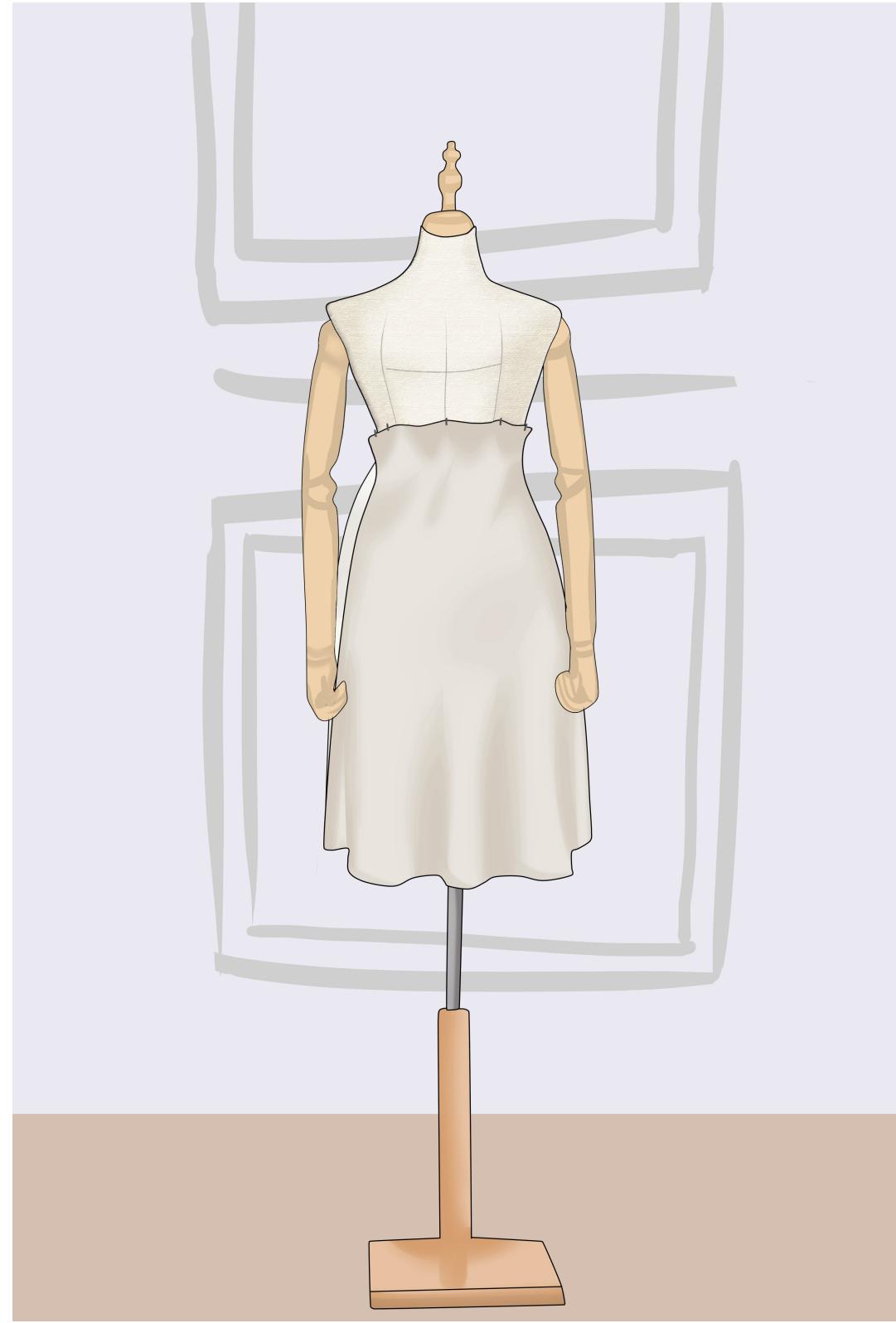
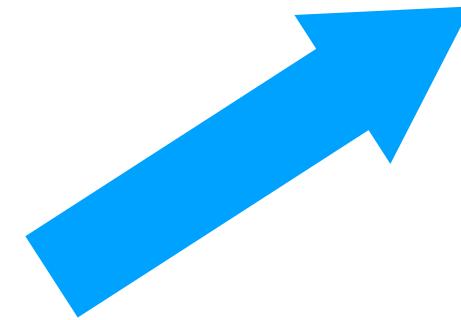


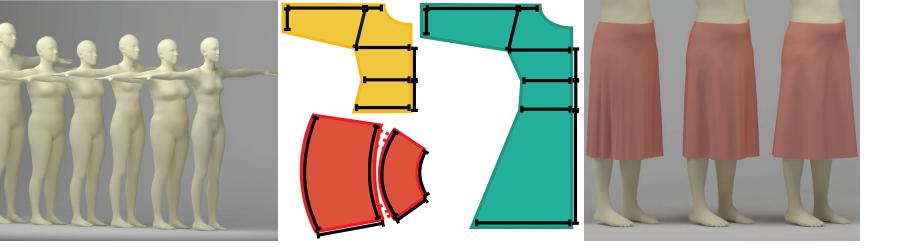
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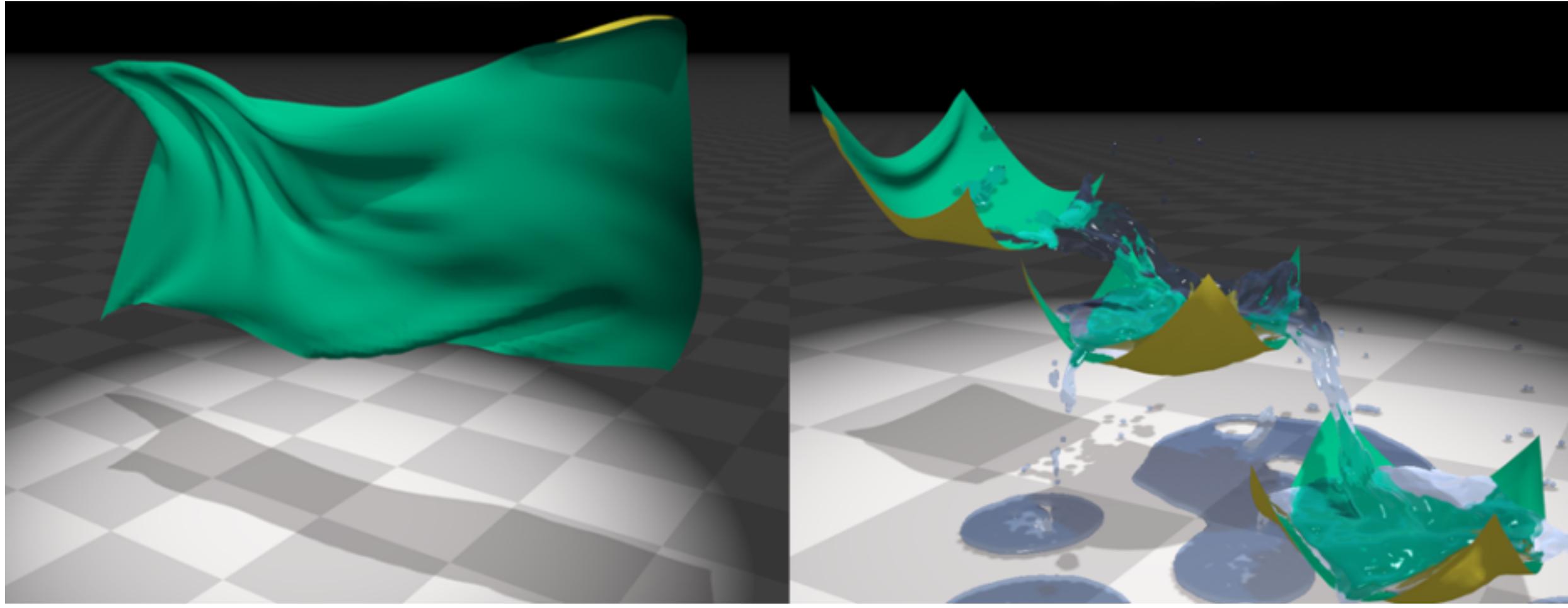
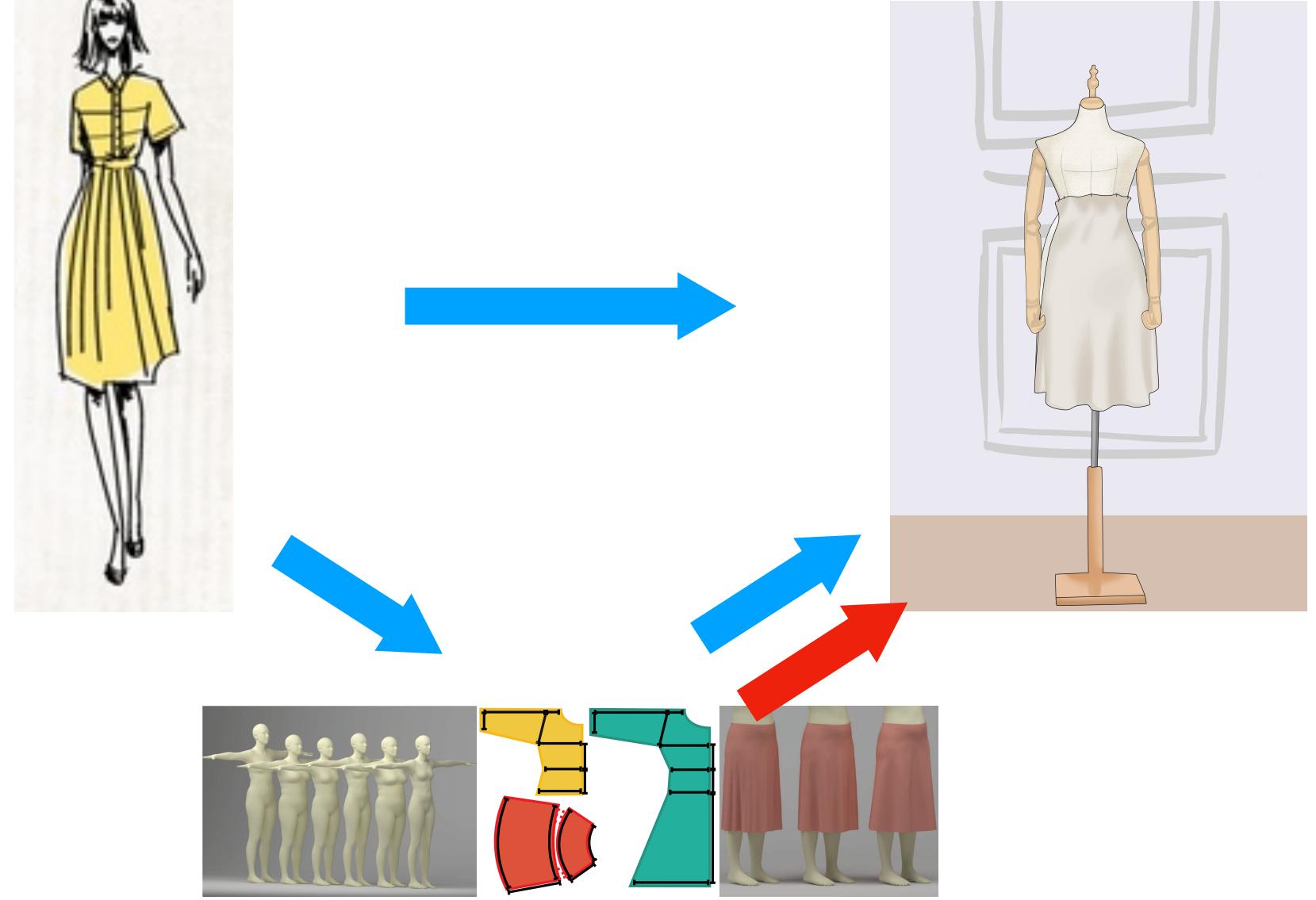


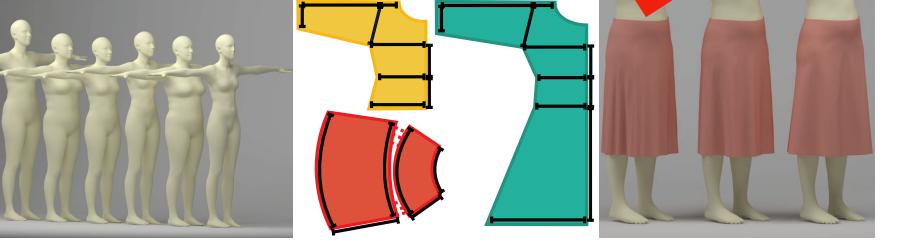
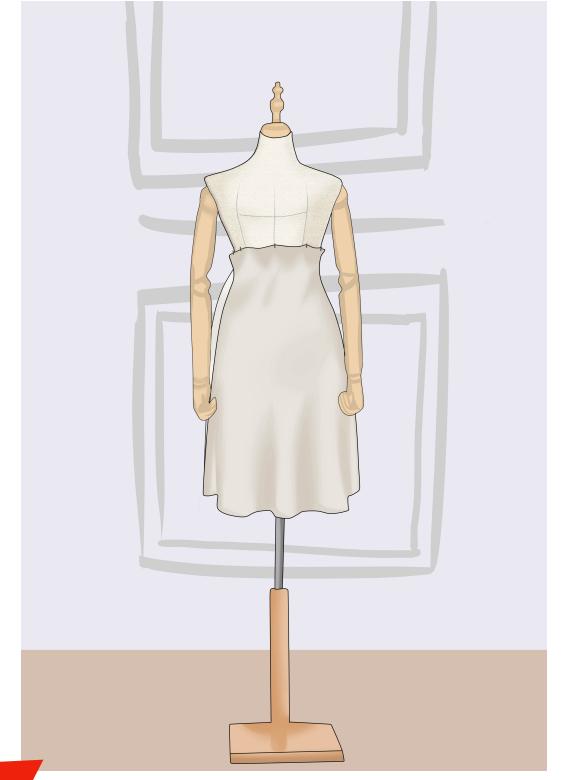


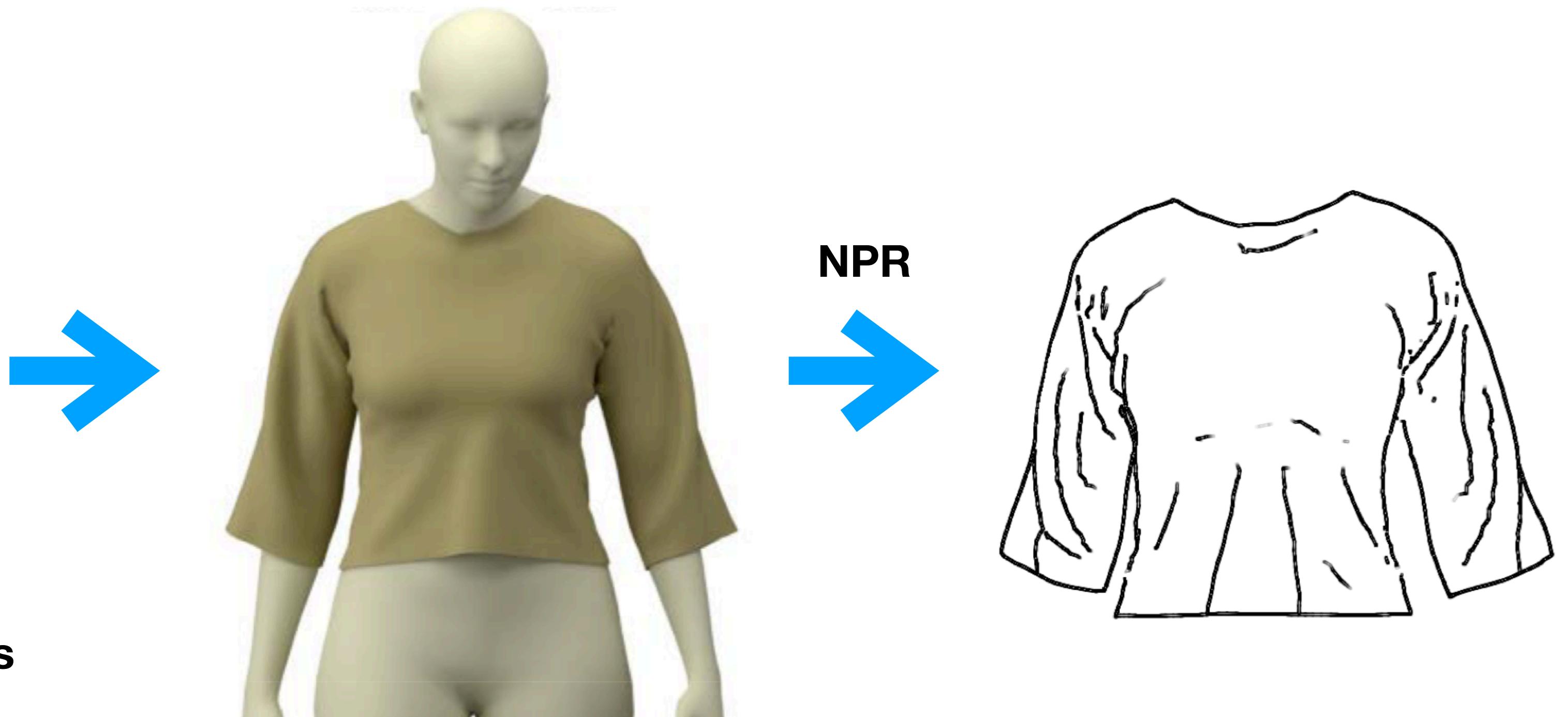
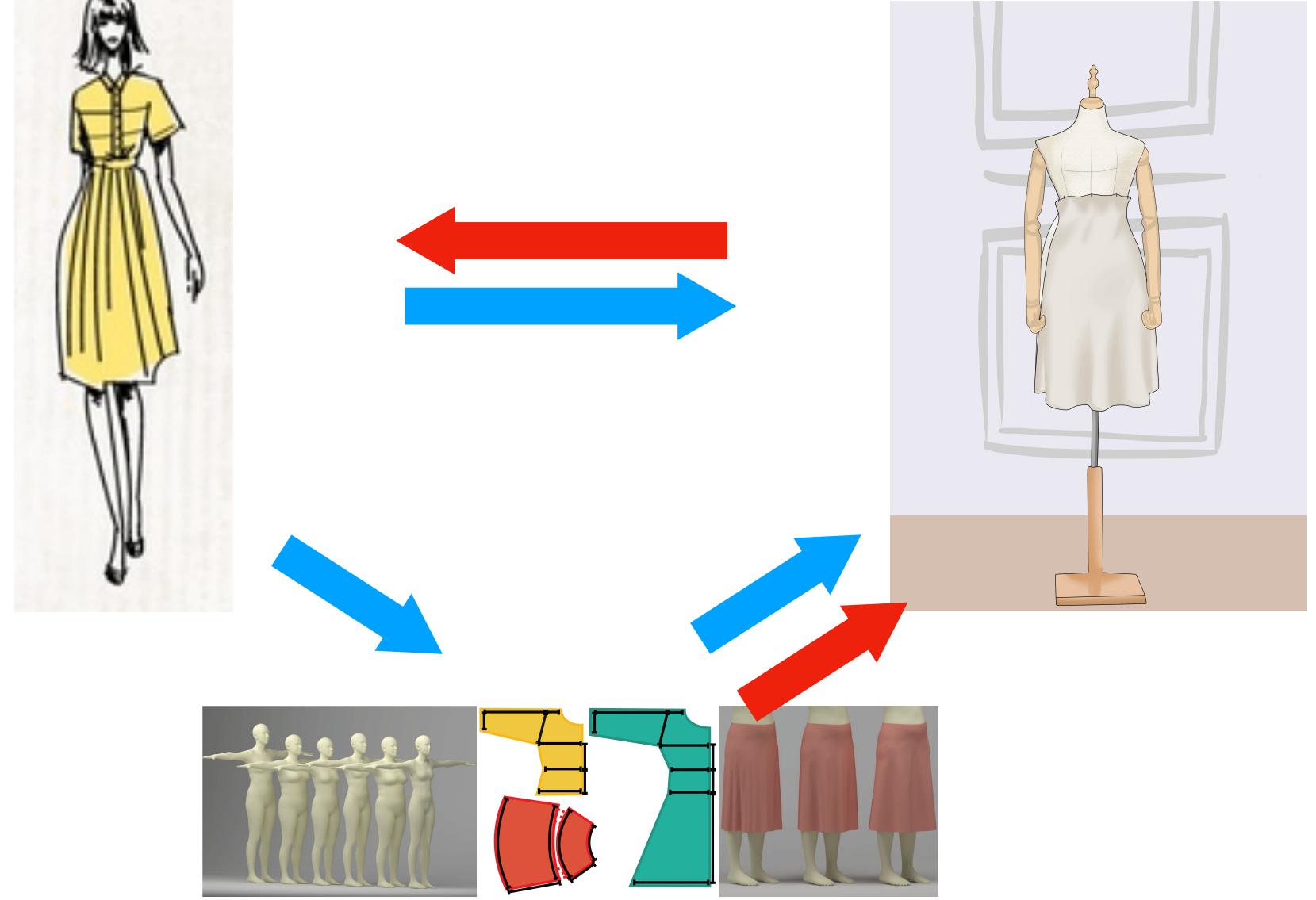
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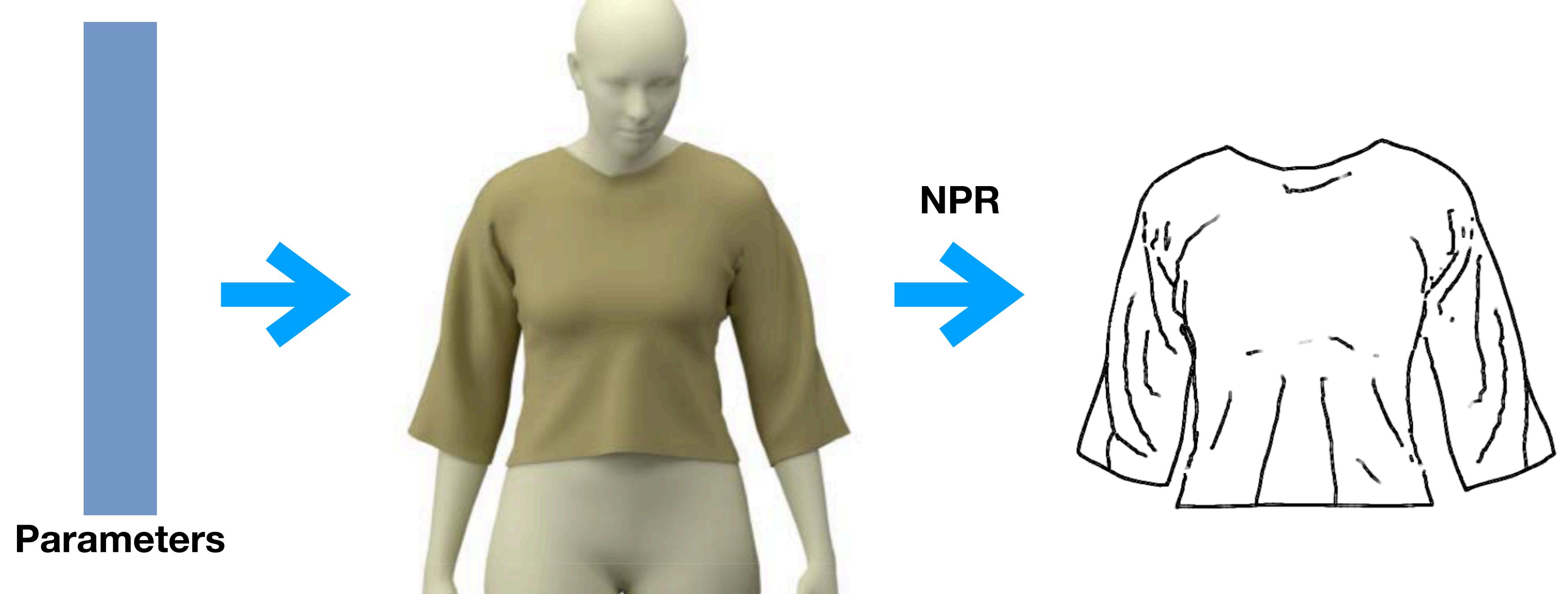
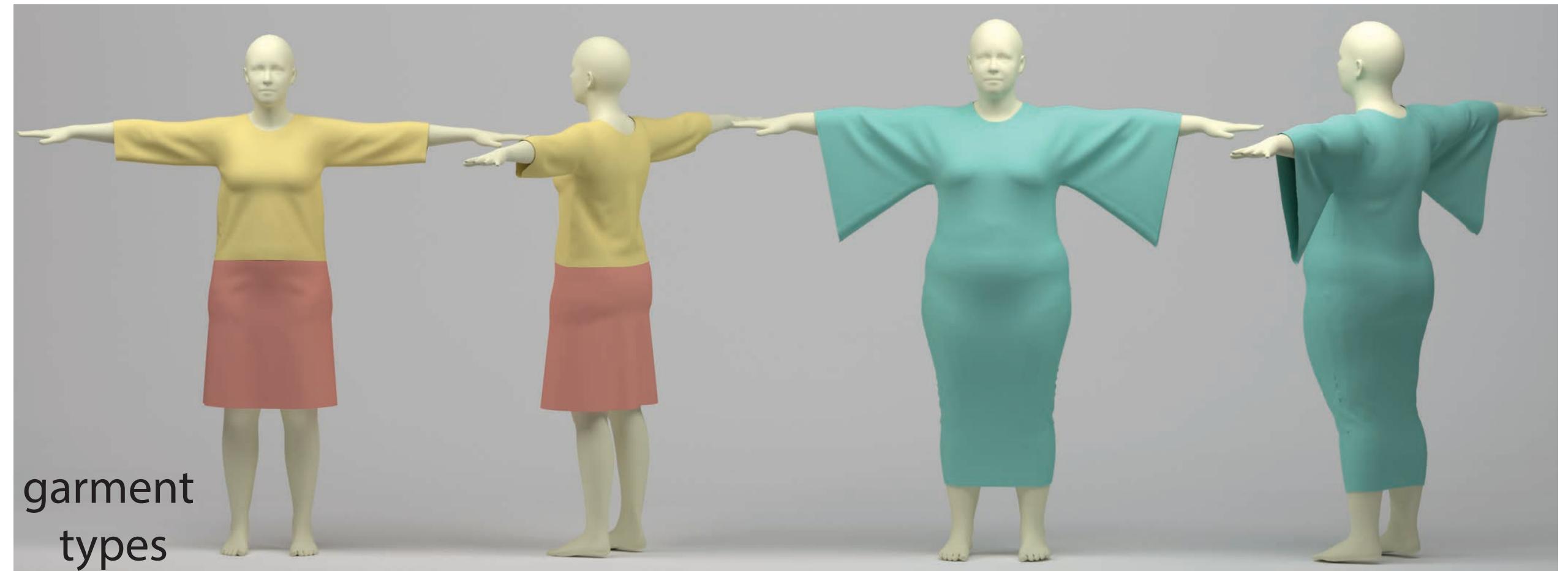
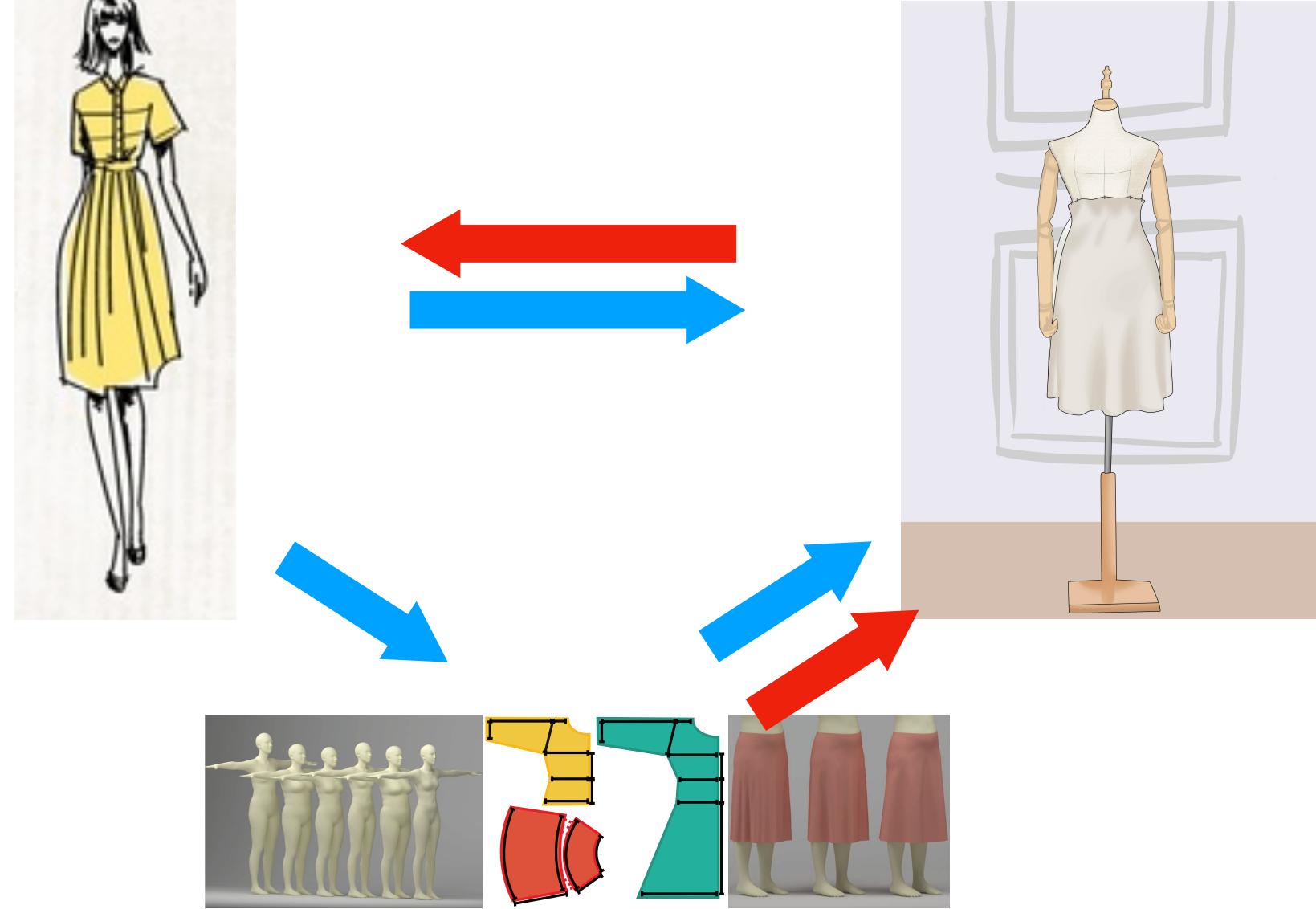


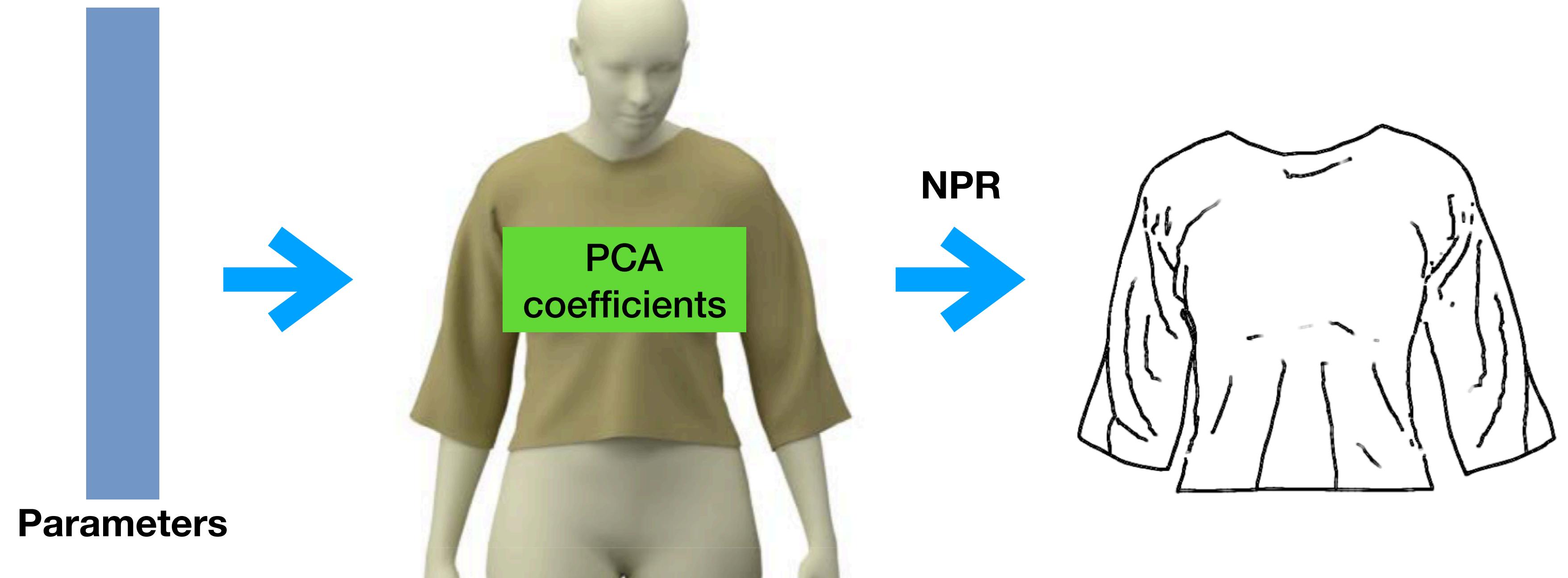
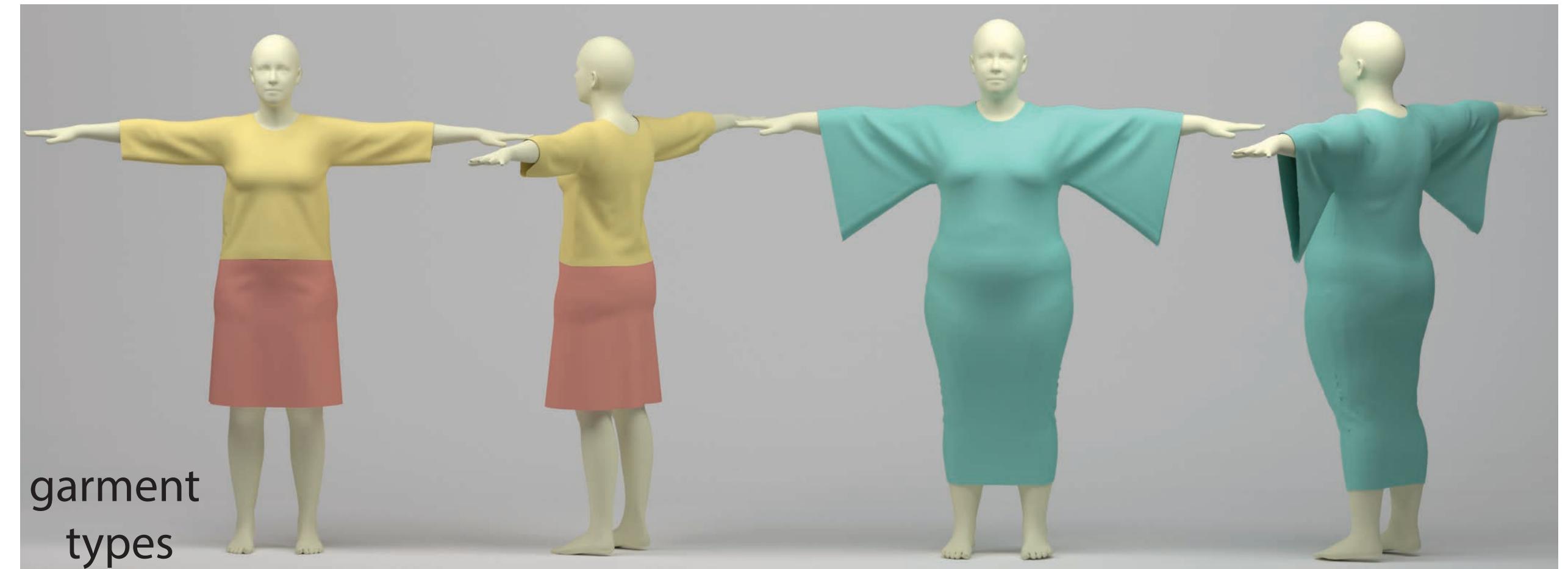
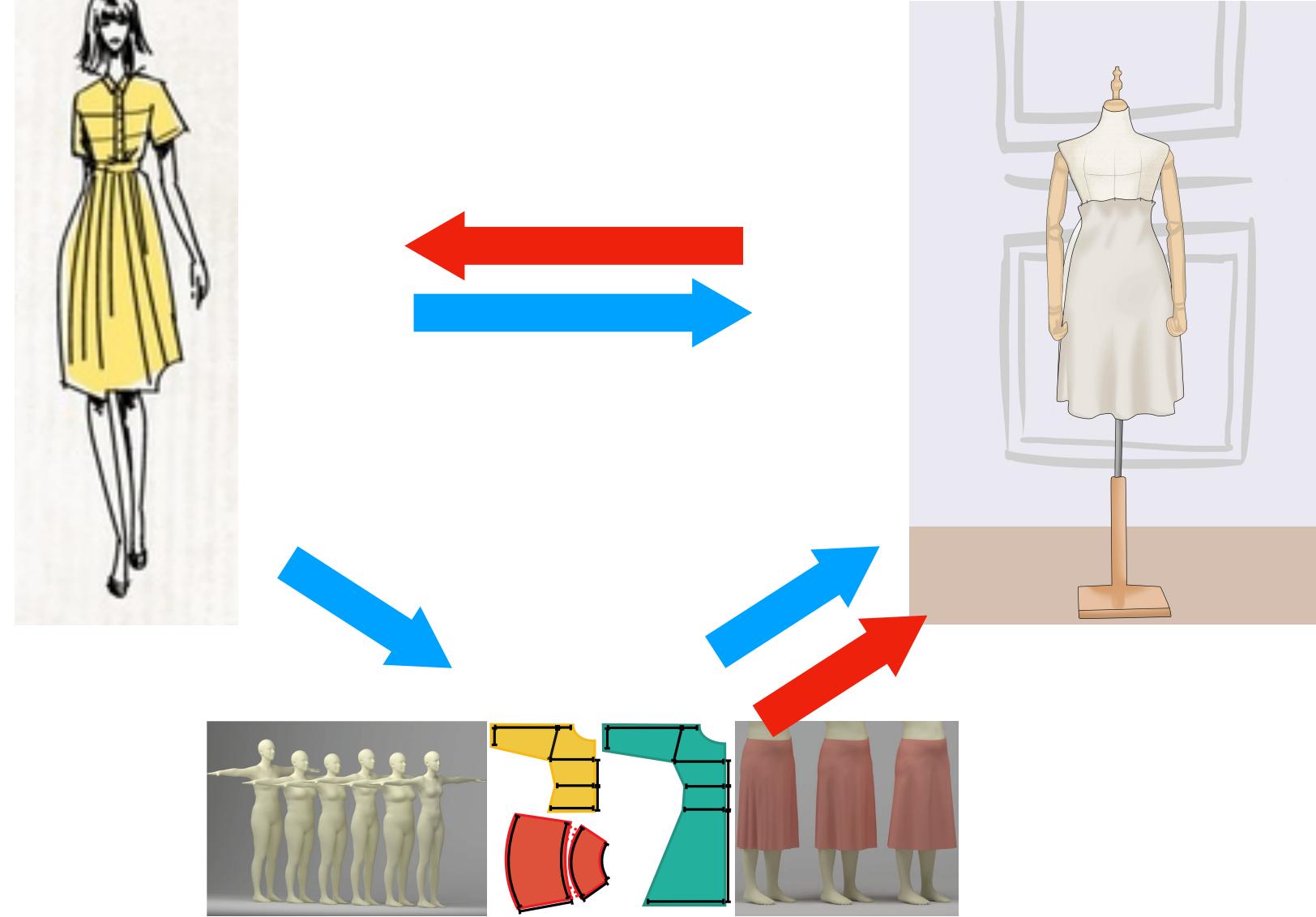


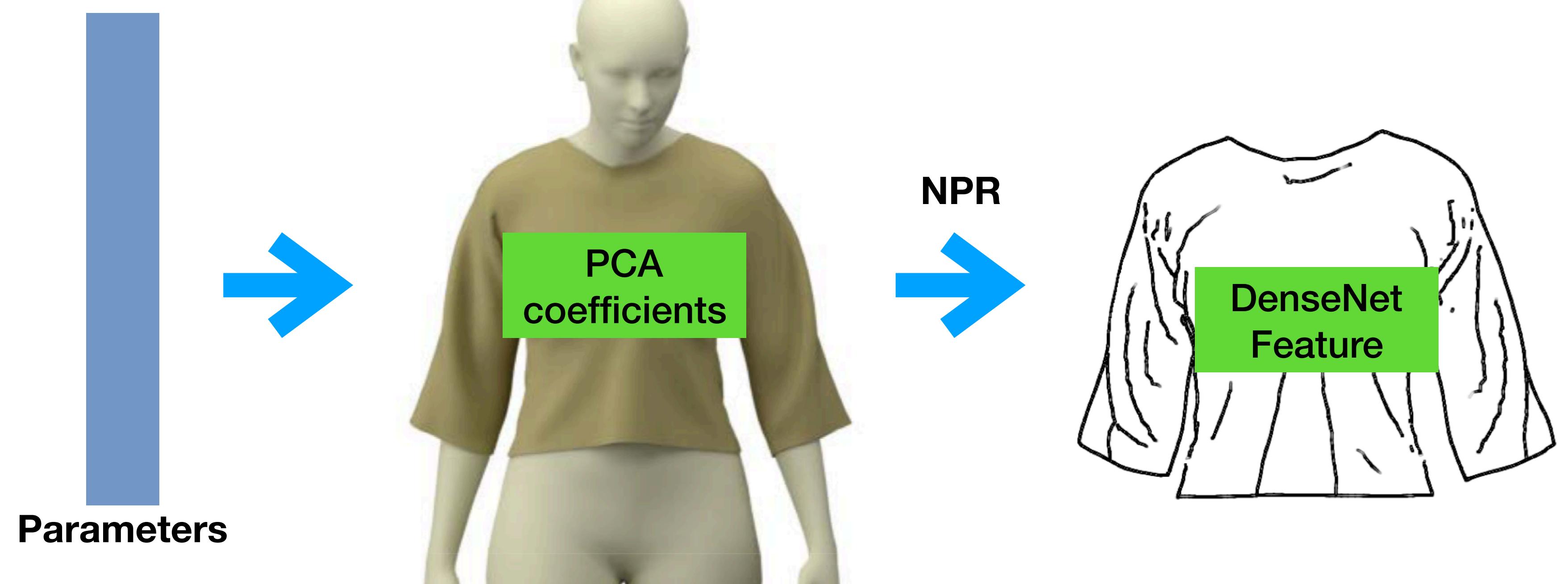
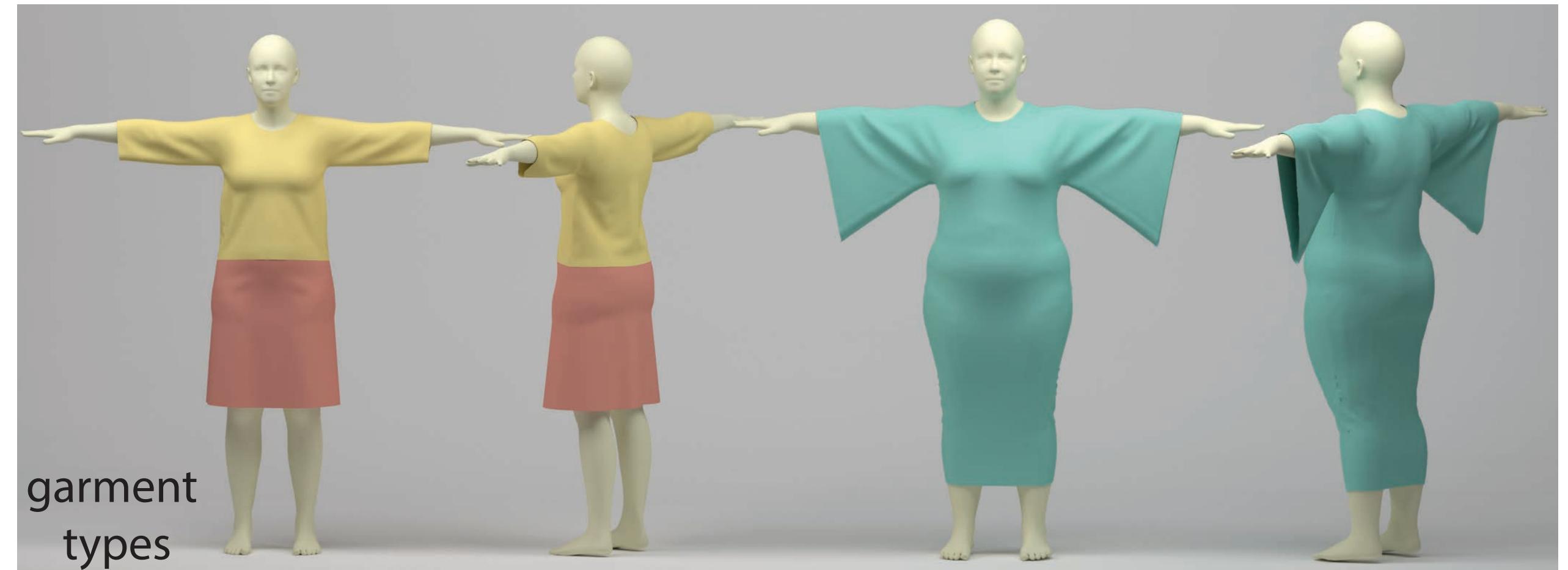
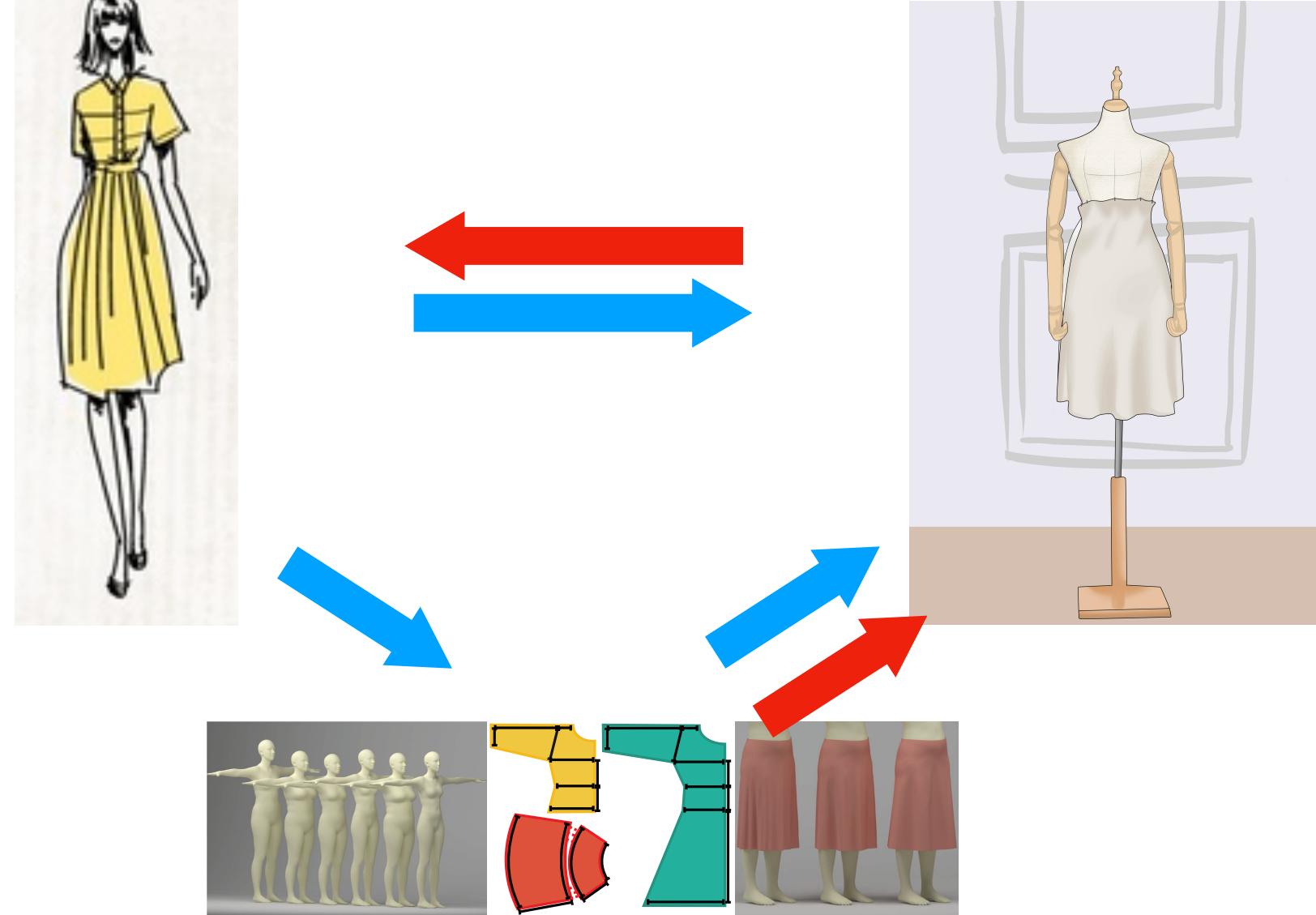




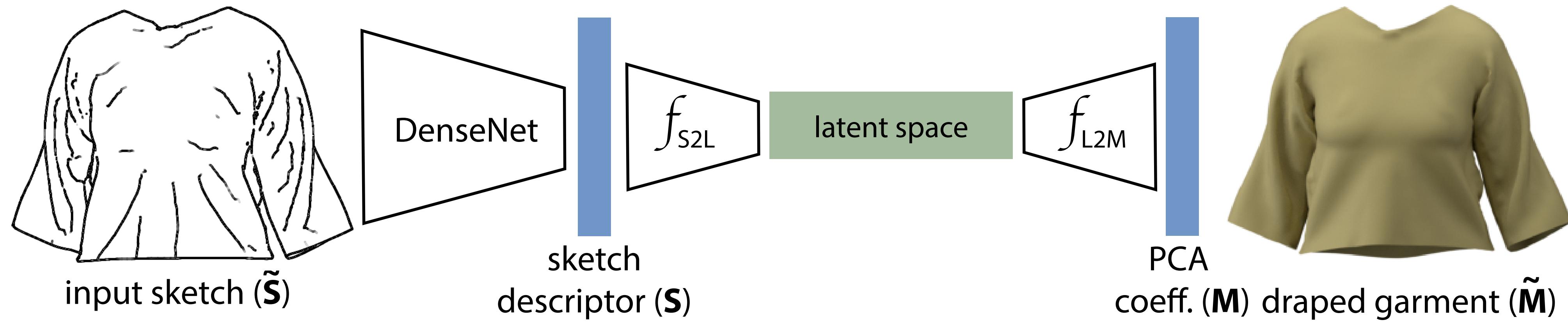




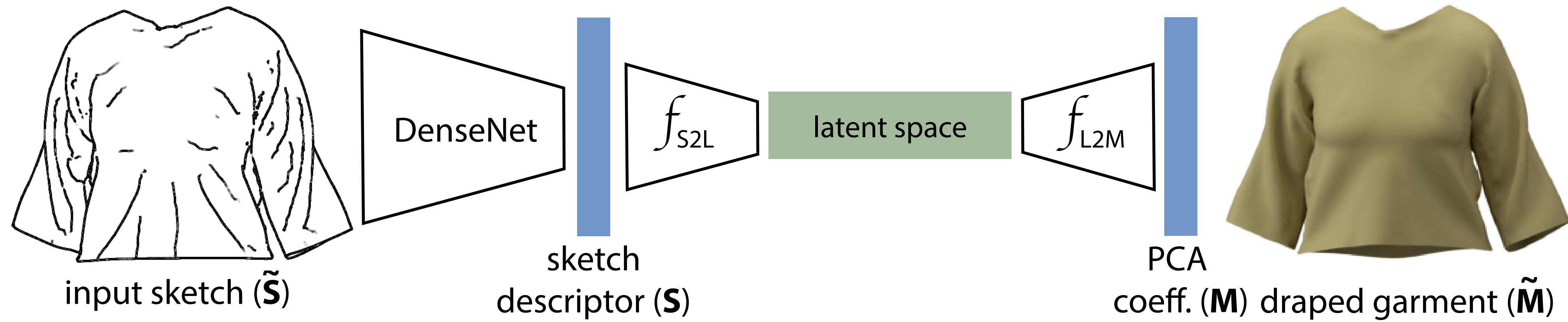




A naive test..



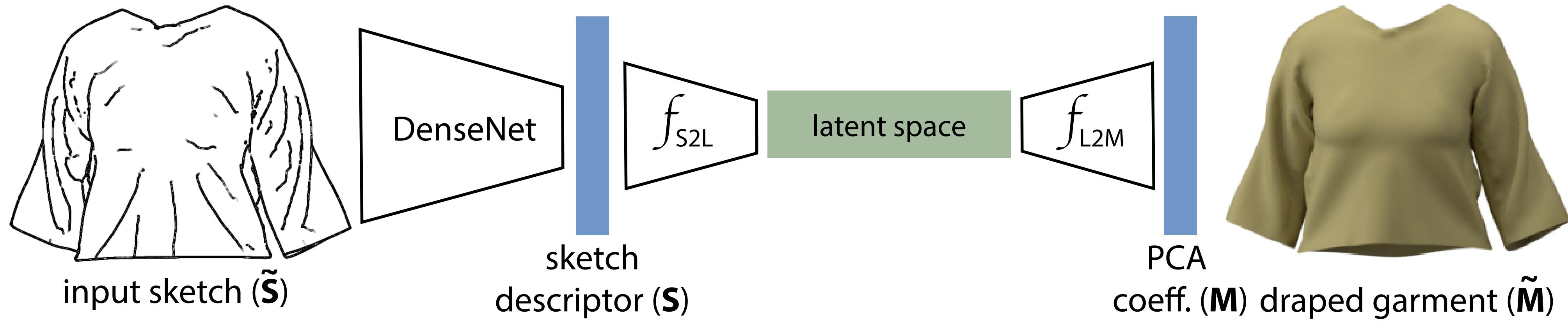
A naive test..



$$\mathcal{L}(P, M, S) =$$

$$\|M - f_{L2M}(f_{S2L}(S))\|_2$$

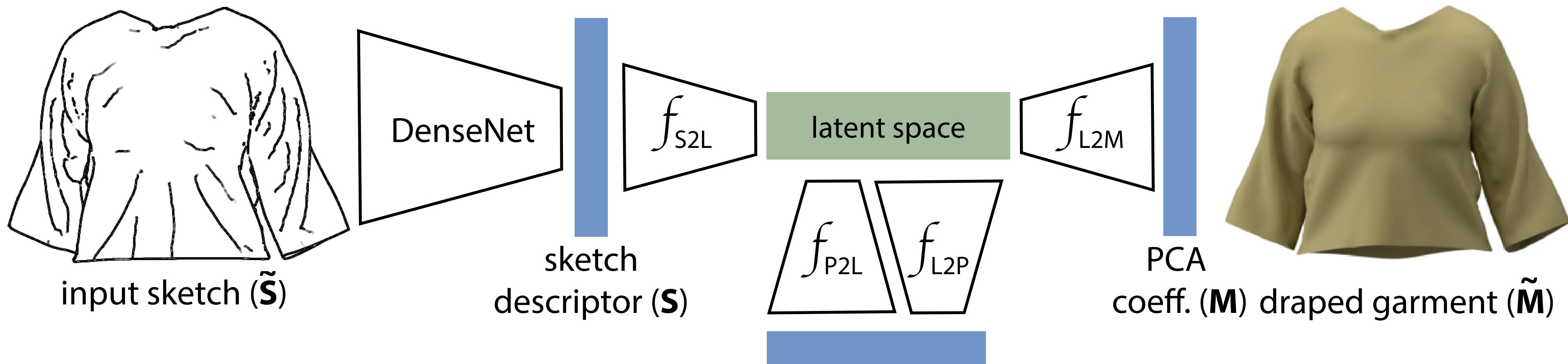
A naive test..



$$\mathcal{L}(P, M, S) =$$

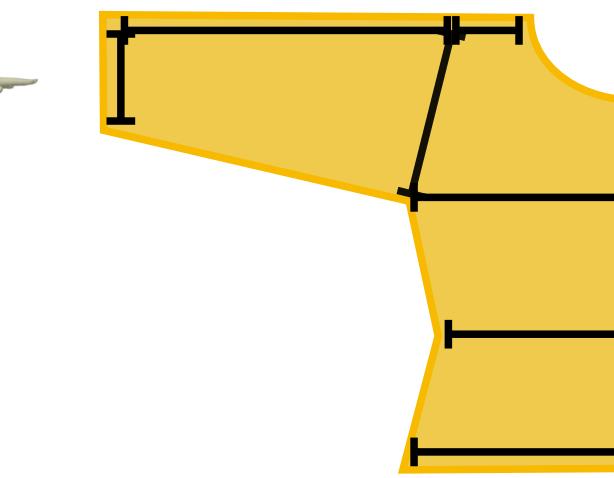
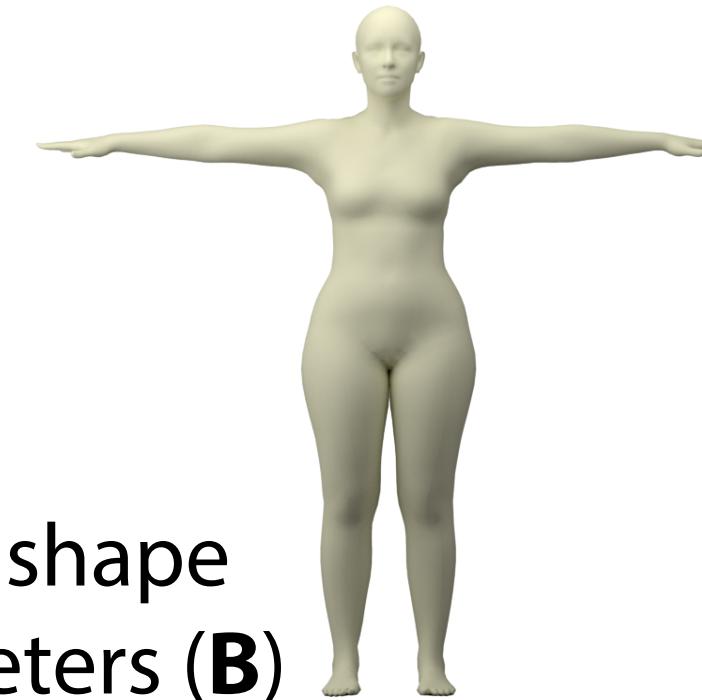
$$\|M - f_{L2M}(f_{S2L}(S))\|_2$$



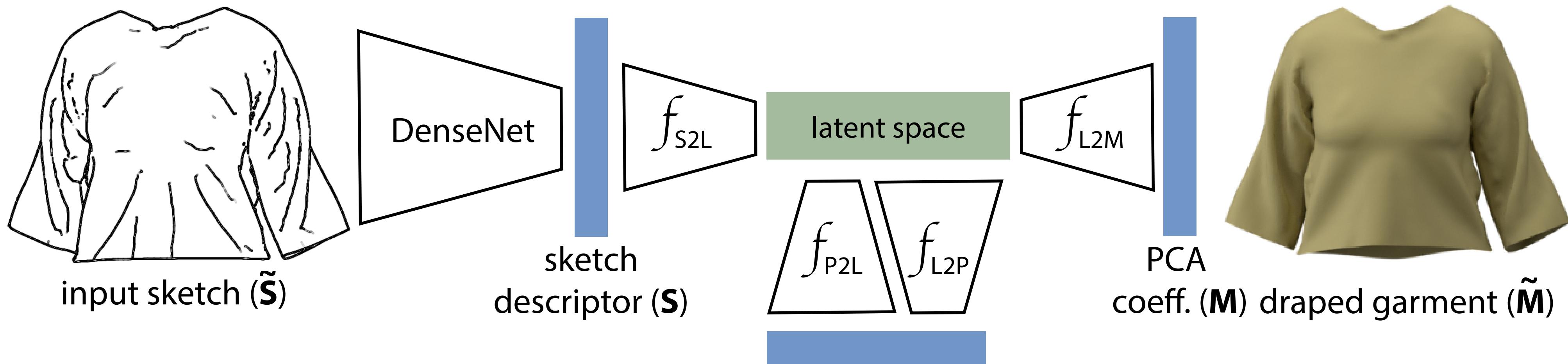


Details Refer to paper

body shape parameters (B)

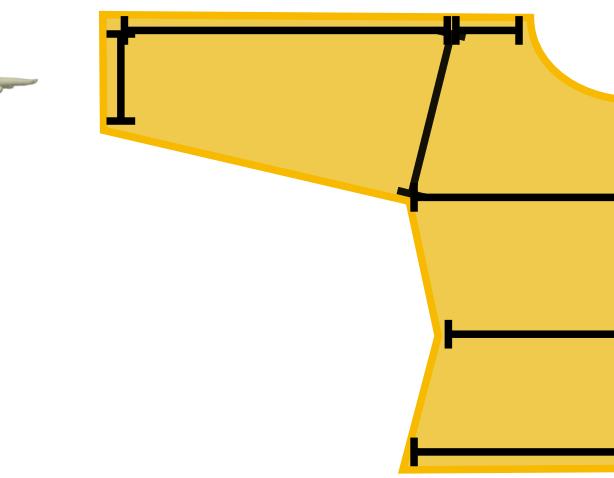
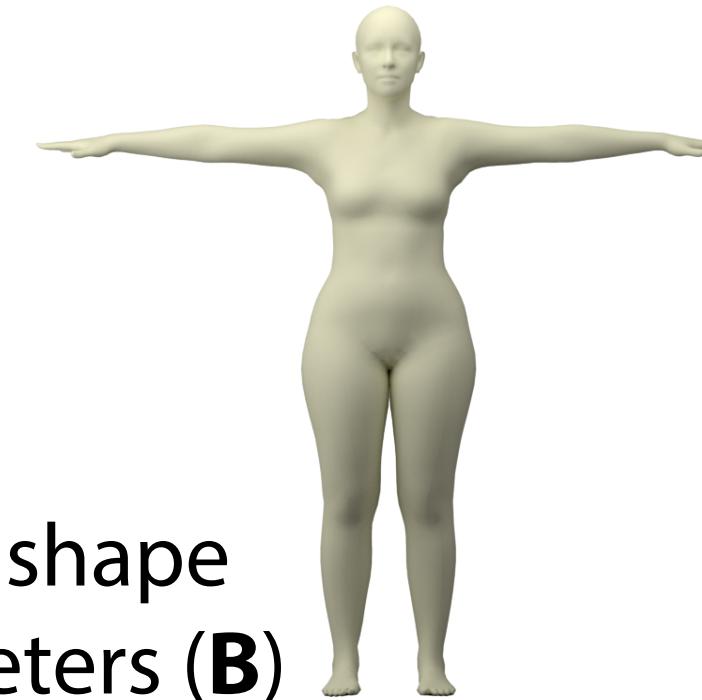


$\{k_{\text{stretch}}, k_{\text{bend}}, k_{\text{shear}}\}$ garment parameters (G)

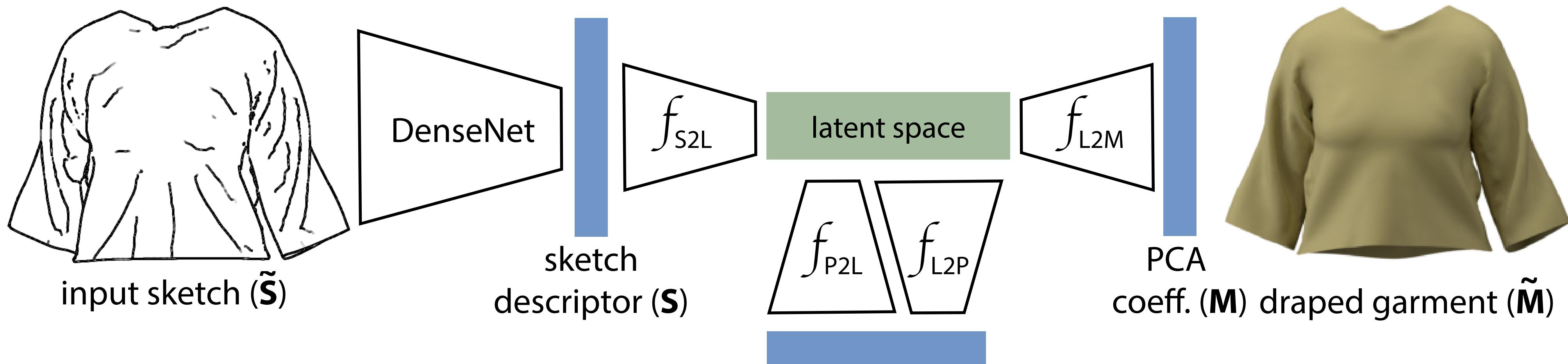


Details Refer to paper

body shape parameters (B)

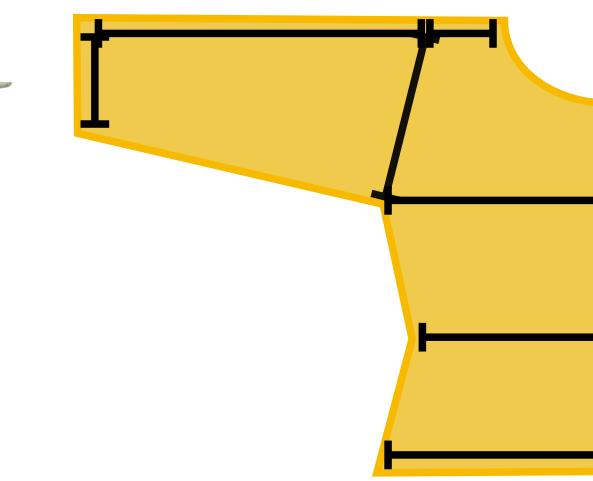
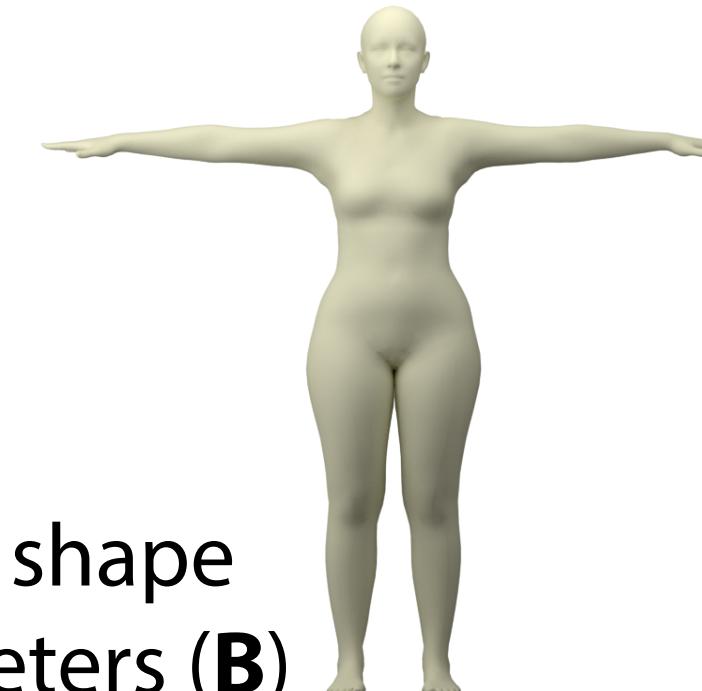


$\{k_{\text{stretch}}, k_{\text{bend}}, k_{\text{shear}}\}$ garment parameters (G)



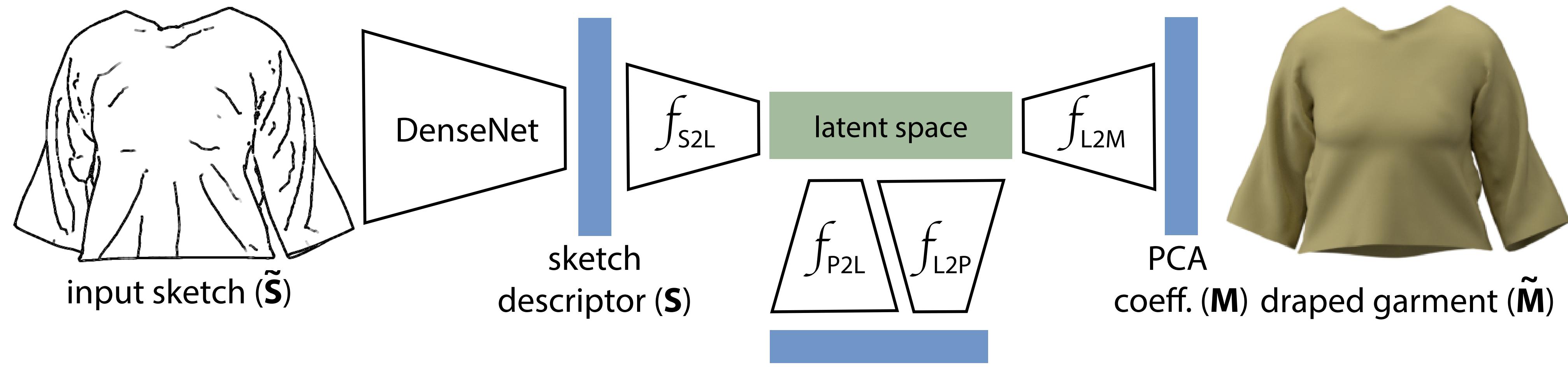
Details Refer to paper

body shape
parameters (B)



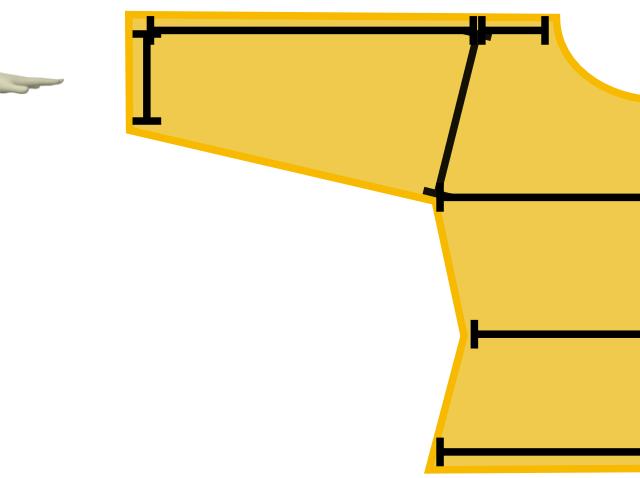
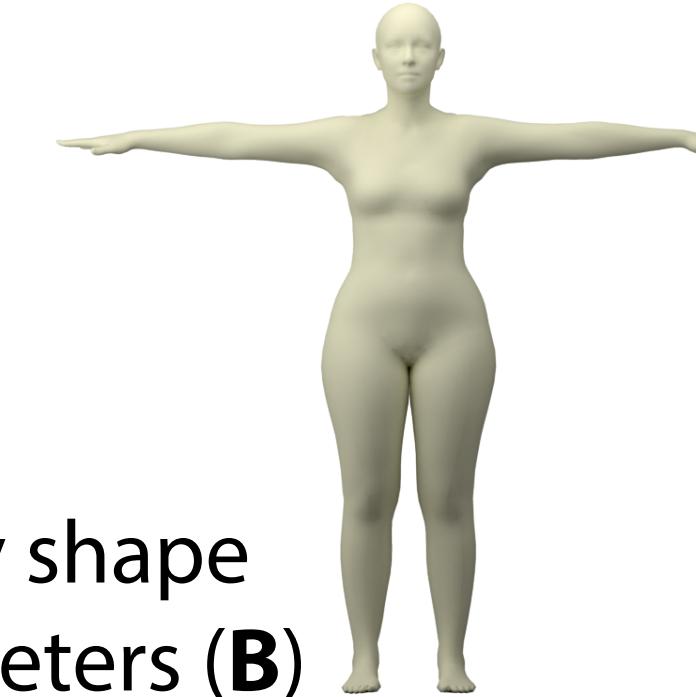
$\{k_{\text{stretch}}, k_{\text{bend}}, k_{\text{shear}}\}$ garment
parameters (G)

$$\|M - f_{L2M}(f_{S2L}(S))\|_2$$



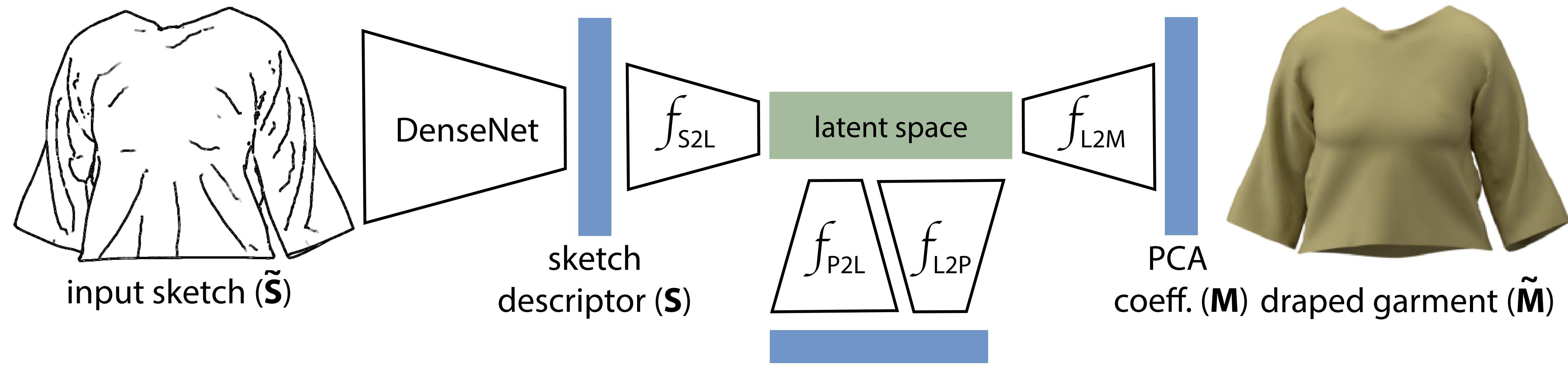
Details Refer to paper

body shape
parameters (B)



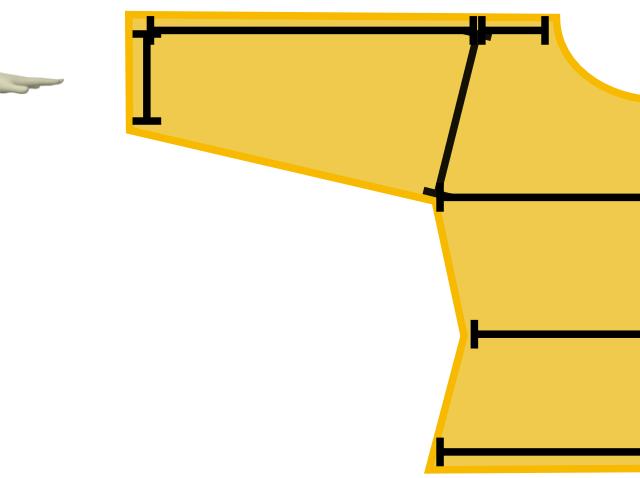
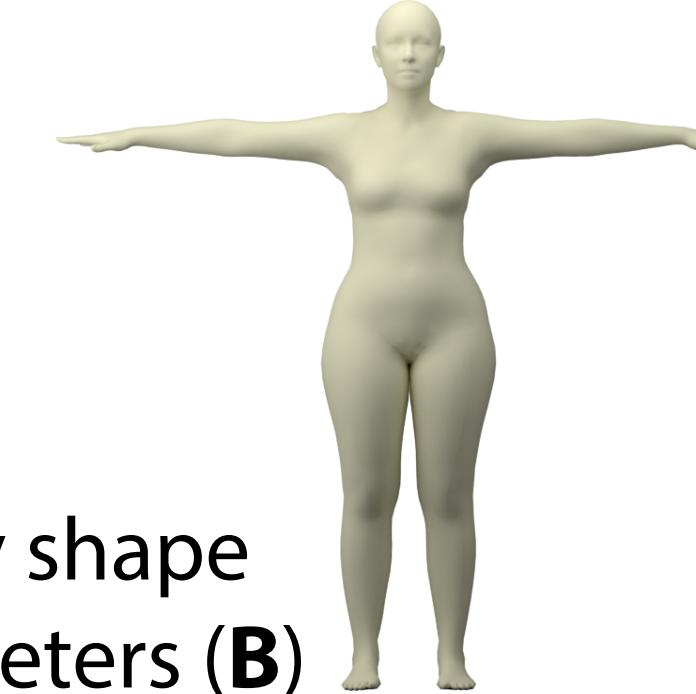
$\{k_{\text{stretch}}, k_{\text{bend}}, k_{\text{shear}}\}$ garment
parameters (G)

$$\|M - f_{L2M}(f_{S2L}(S))\|_2 \quad \|P - f_{L2P}(f_{S2L}(S))\|_2$$



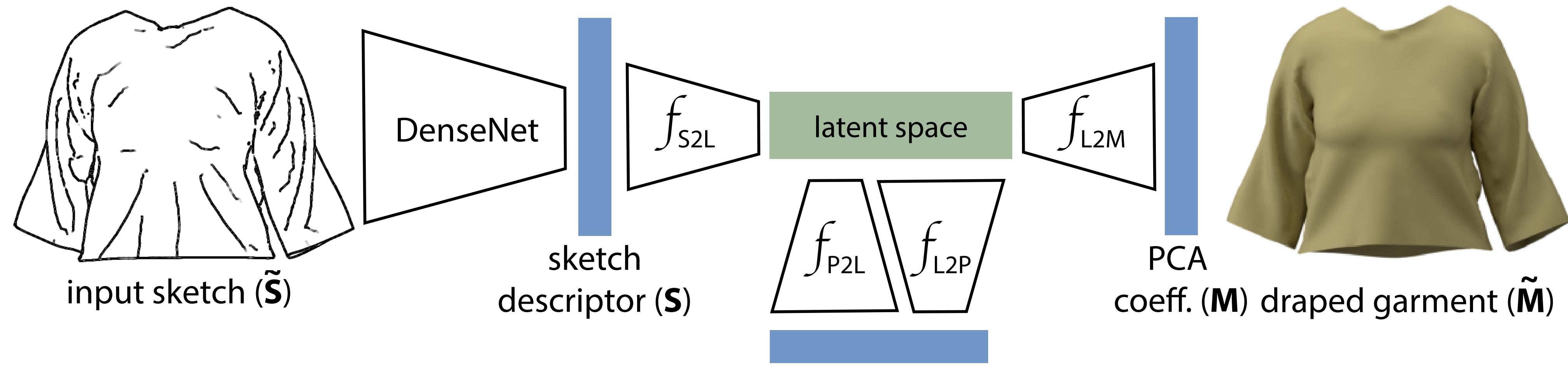
Details Refer to paper

body shape
parameters (B)



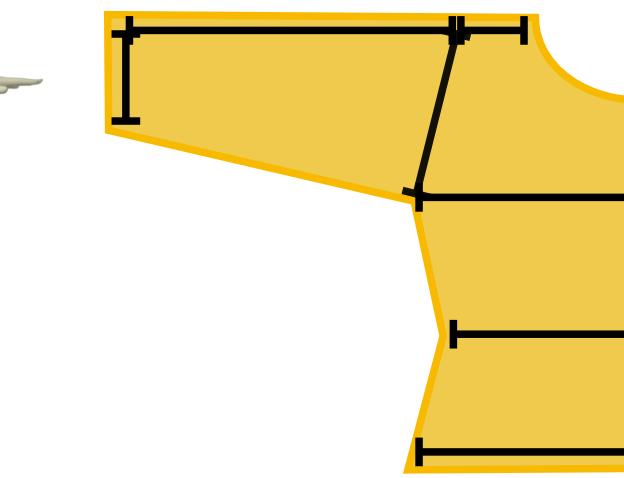
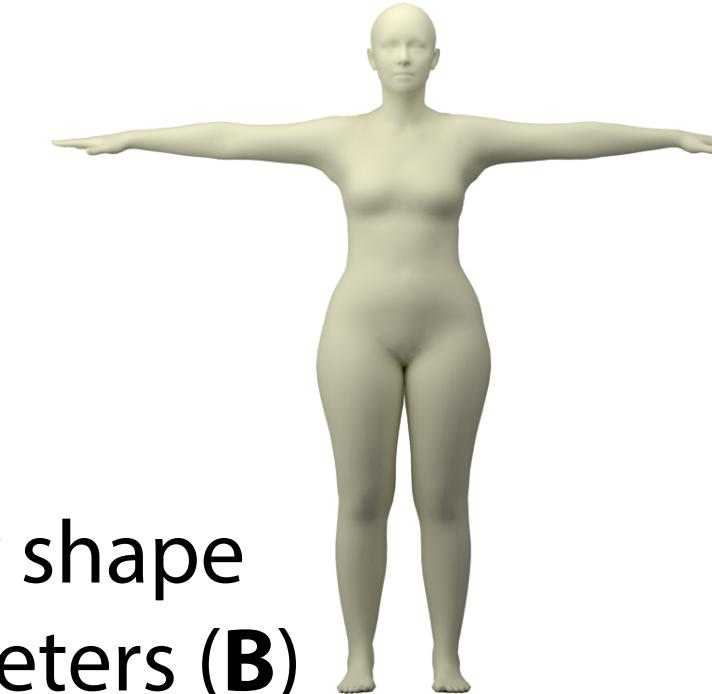
$\{k_{\text{stretch}}, k_{\text{bend}}, k_{\text{shear}}\}$ garment
parameters (G)

$$\|M - f_{L2M}(f_{S2L}(S))\|_2 \quad \|P - f_{L2P}(f_{S2L}(S))\|_2 \quad \|M - f_{L2M}(f_{P2L}(P))\|_2$$



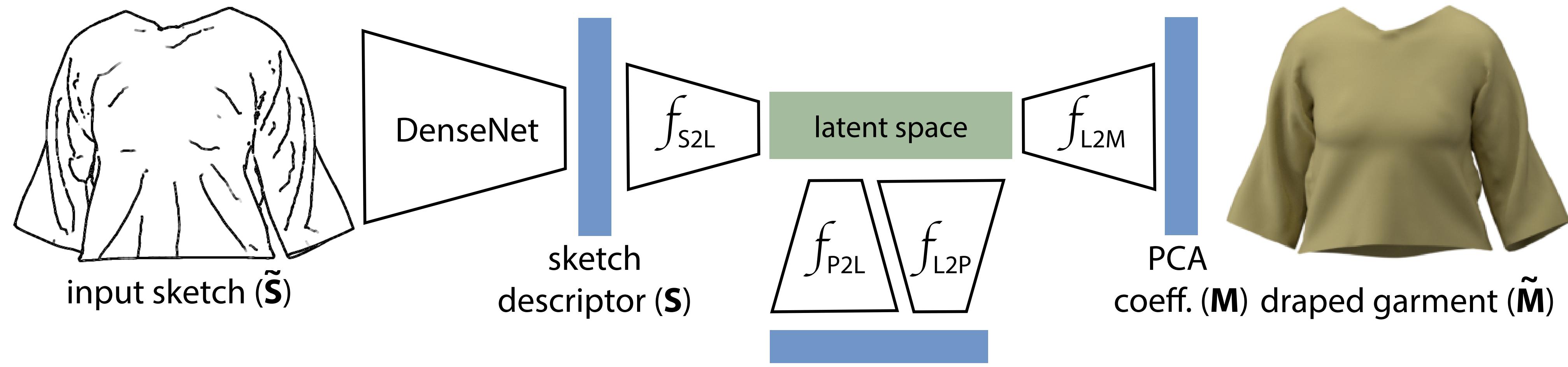
Details Refer to paper

body shape
parameters (B)



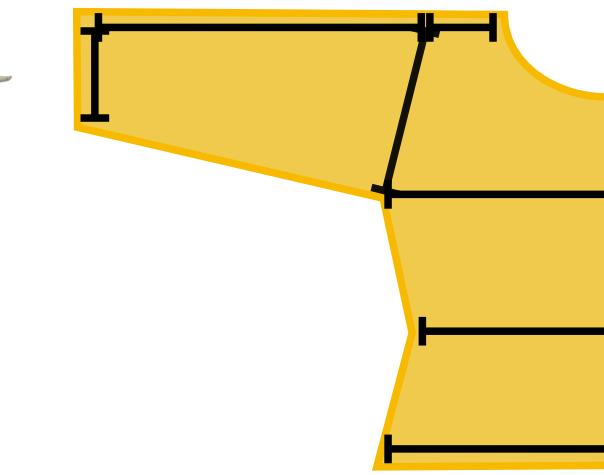
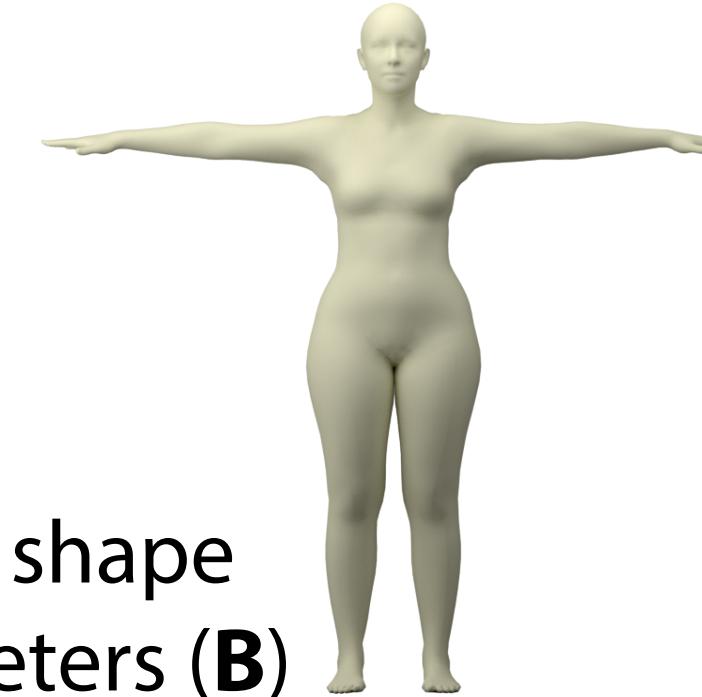
$\{k_{\text{stretch}}, k_{\text{bend}}, k_{\text{shear}}\}$ garment
parameters (G)

$$\|M - f_{L2M}(f_{S2L}(S))\|_2 \quad \|P - f_{L2P}(f_{S2L}(S))\|_2 \quad \|M - f_{L2M}(f_{P2L}(P))\|_2 \quad \|P - f_{L2P}(f_{P2L}(P))\|_2$$



Details Refer to paper

body shape
parameters (B)



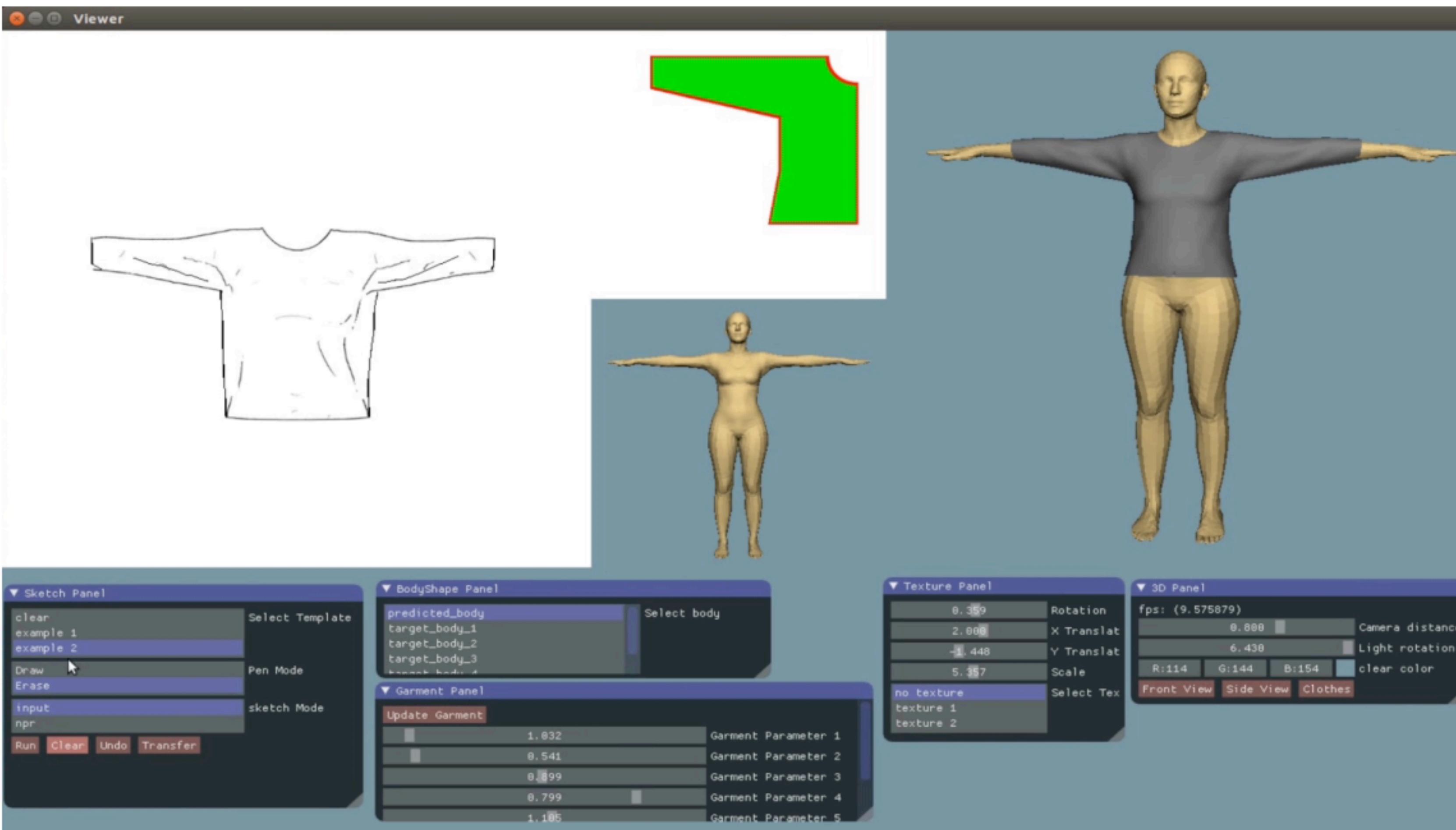
$\{k_{\text{stretch}}, k_{\text{bend}}, k_{\text{shear}}\}$ garment
parameters (G)

$$\mathcal{L}(P, M, S) =$$

$$\|M - f_{L2M}(f_{S2L}(S))\|_2 + \|P - f_{L2P}(f_{S2L}(S))\|_2 + \|M - f_{L2M}(f_{P2L}(P))\|_2 + \|P - f_{L2P}(f_{P2L}(P))\|_2$$

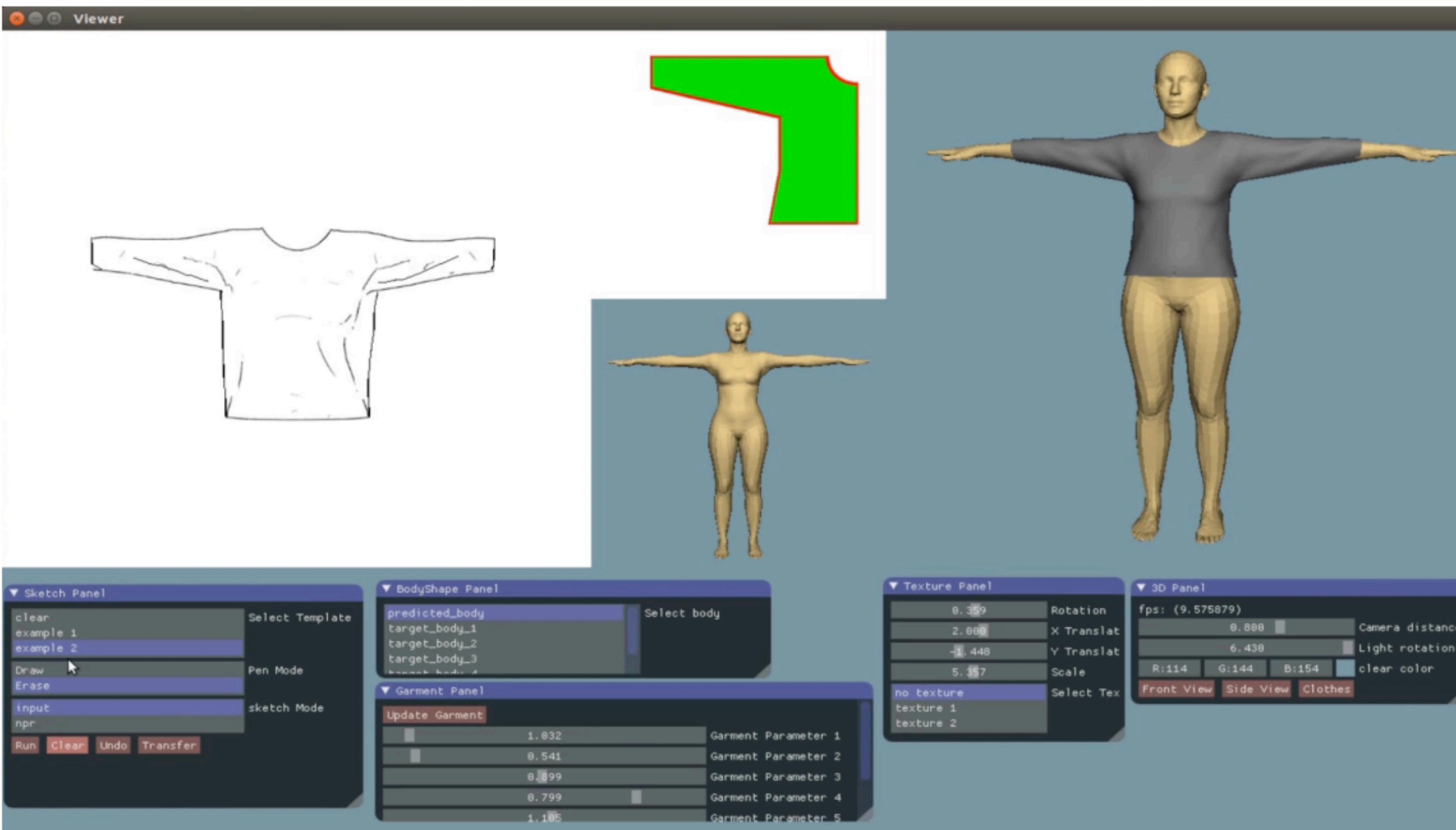
Sketch editing:

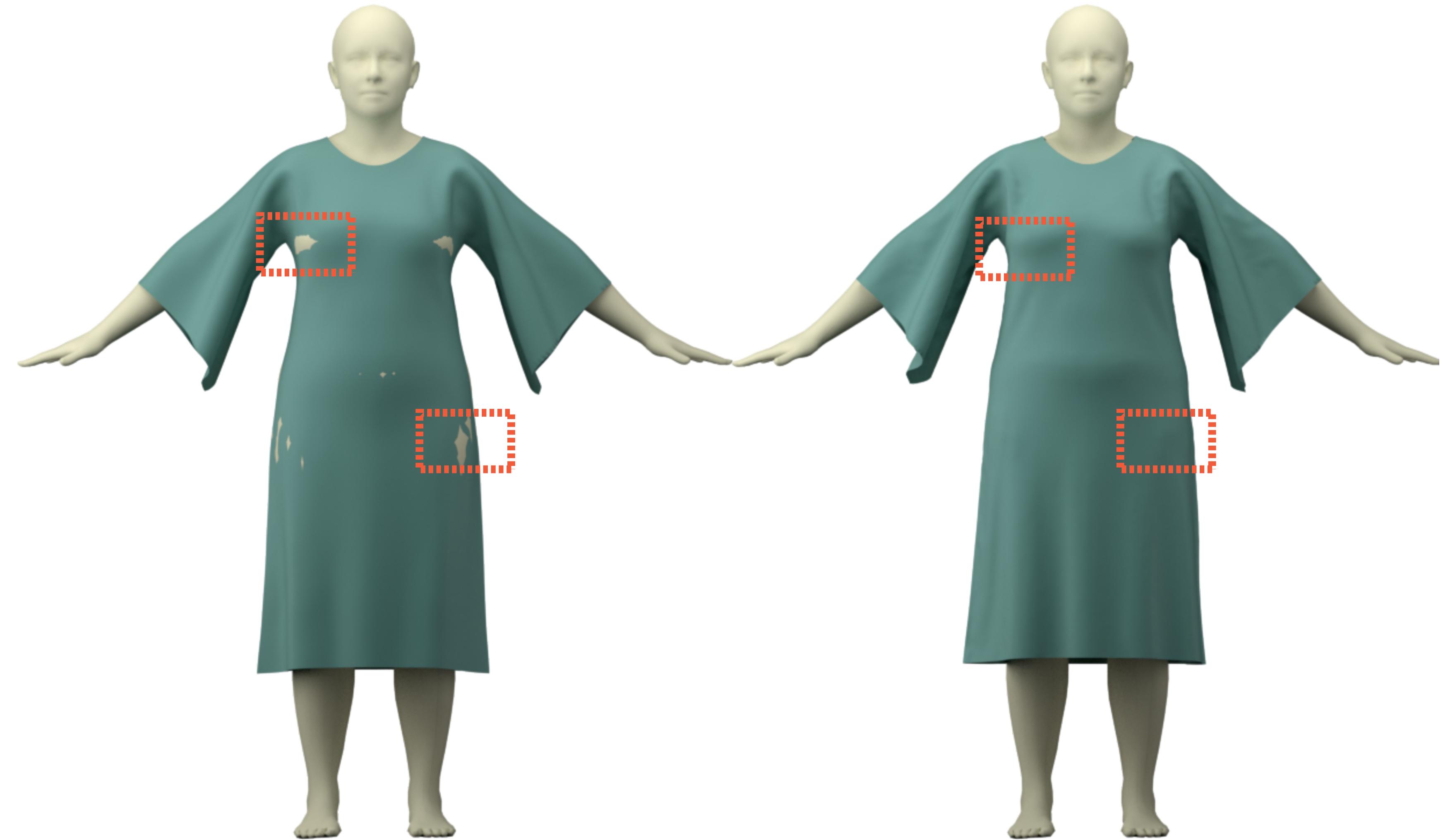
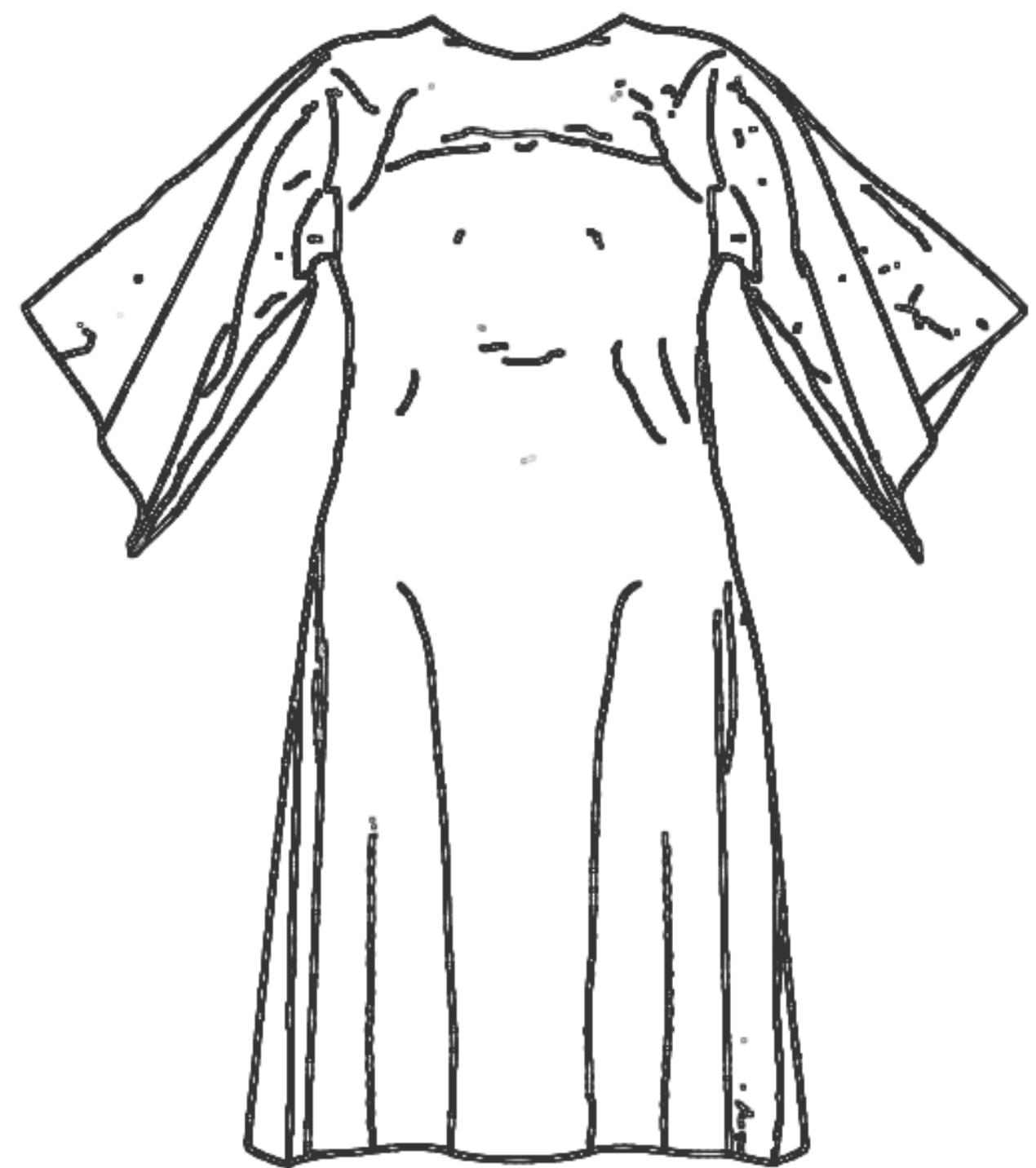
x4



Sketch editing:

x4



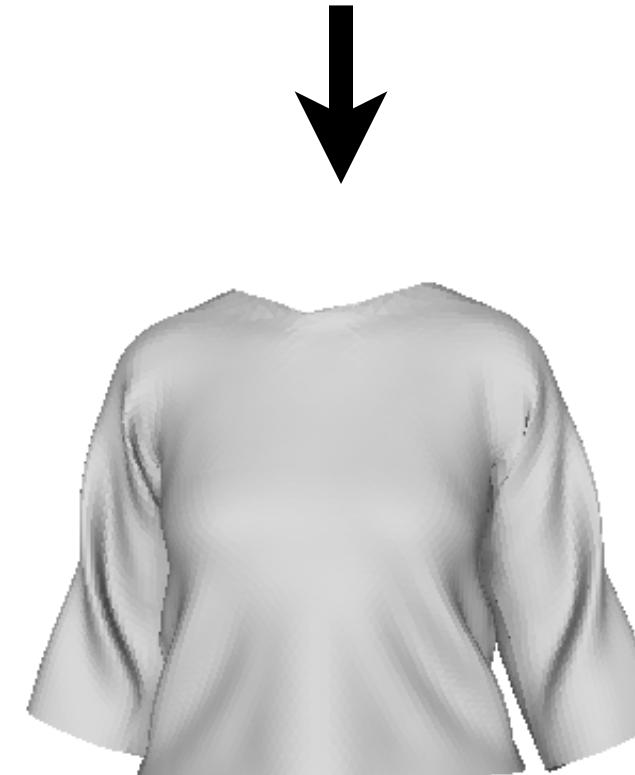
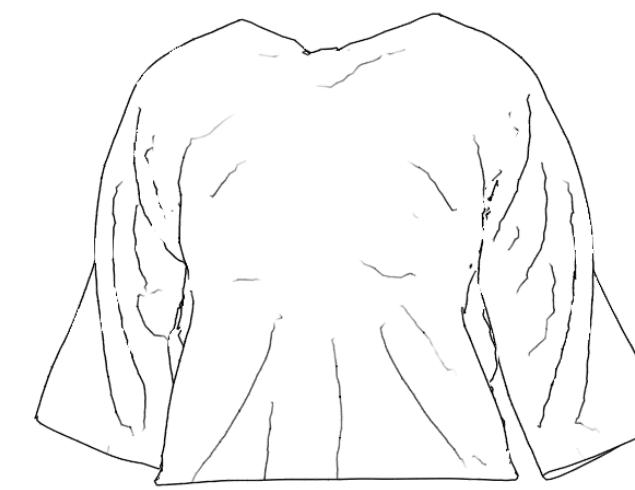


network output

simulated

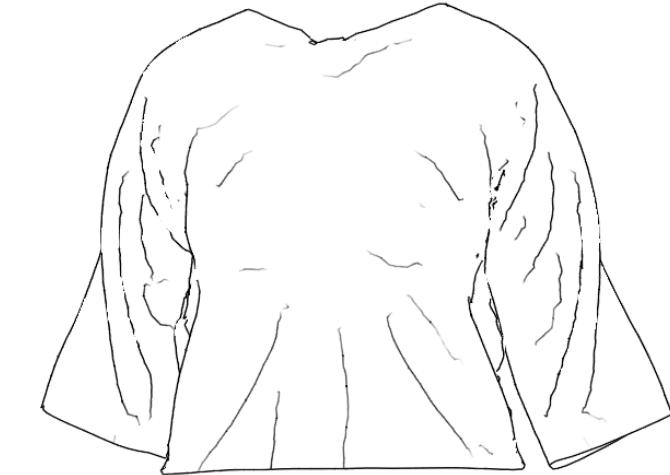
User study on prediction accuracy

2D sketch



3D Shape

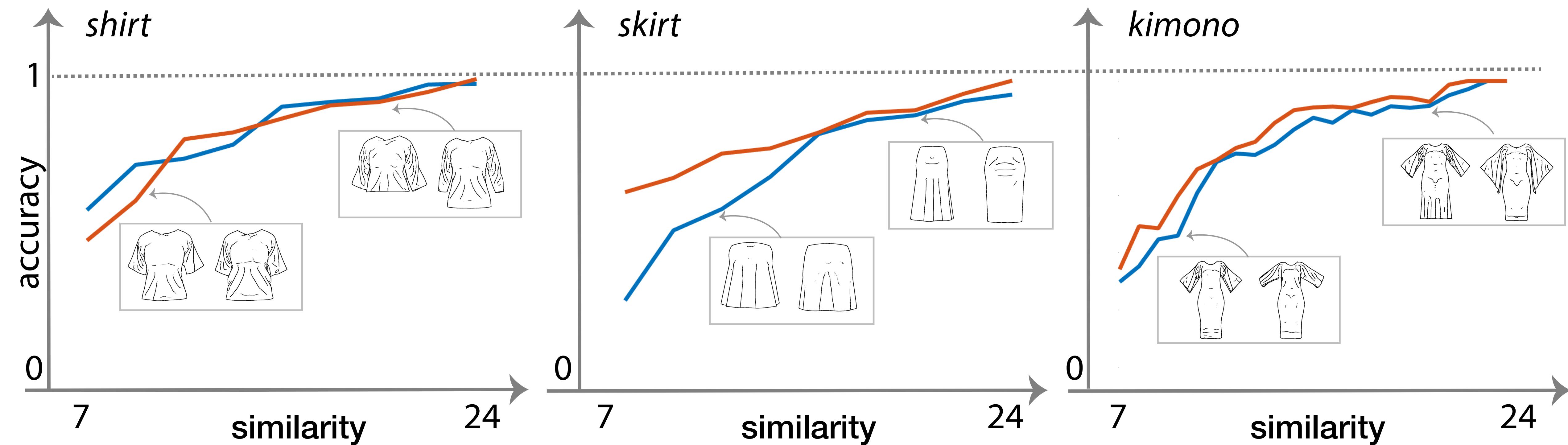
OR



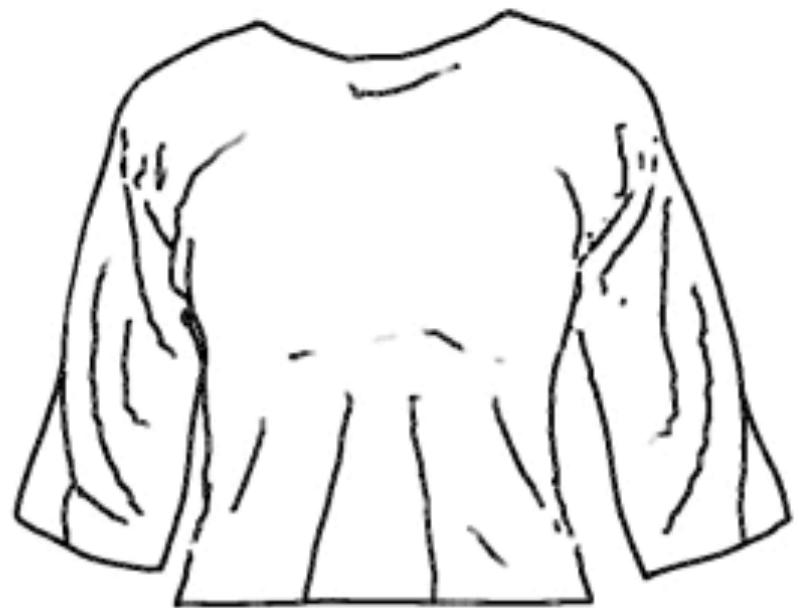
(correct)

(wrong)

User study on prediction accuracy



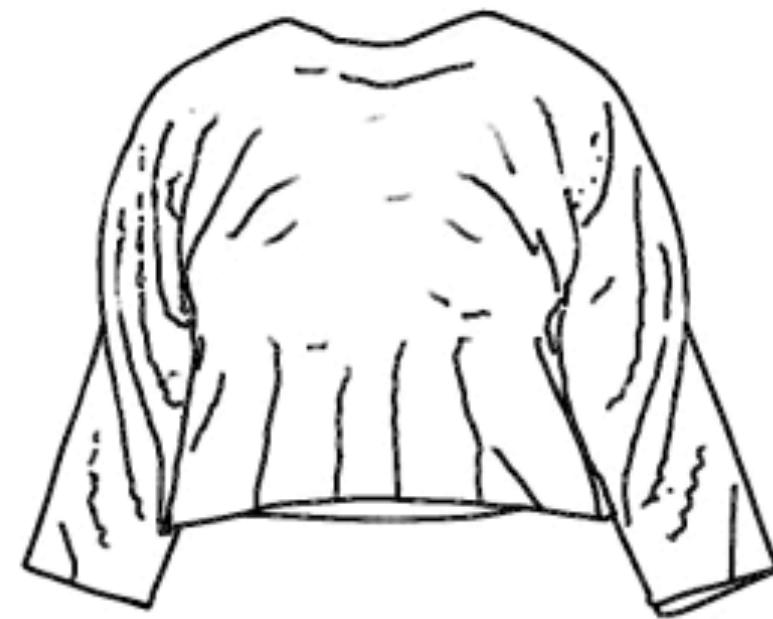
input sketch:



output (with and without texture):



input sketch:



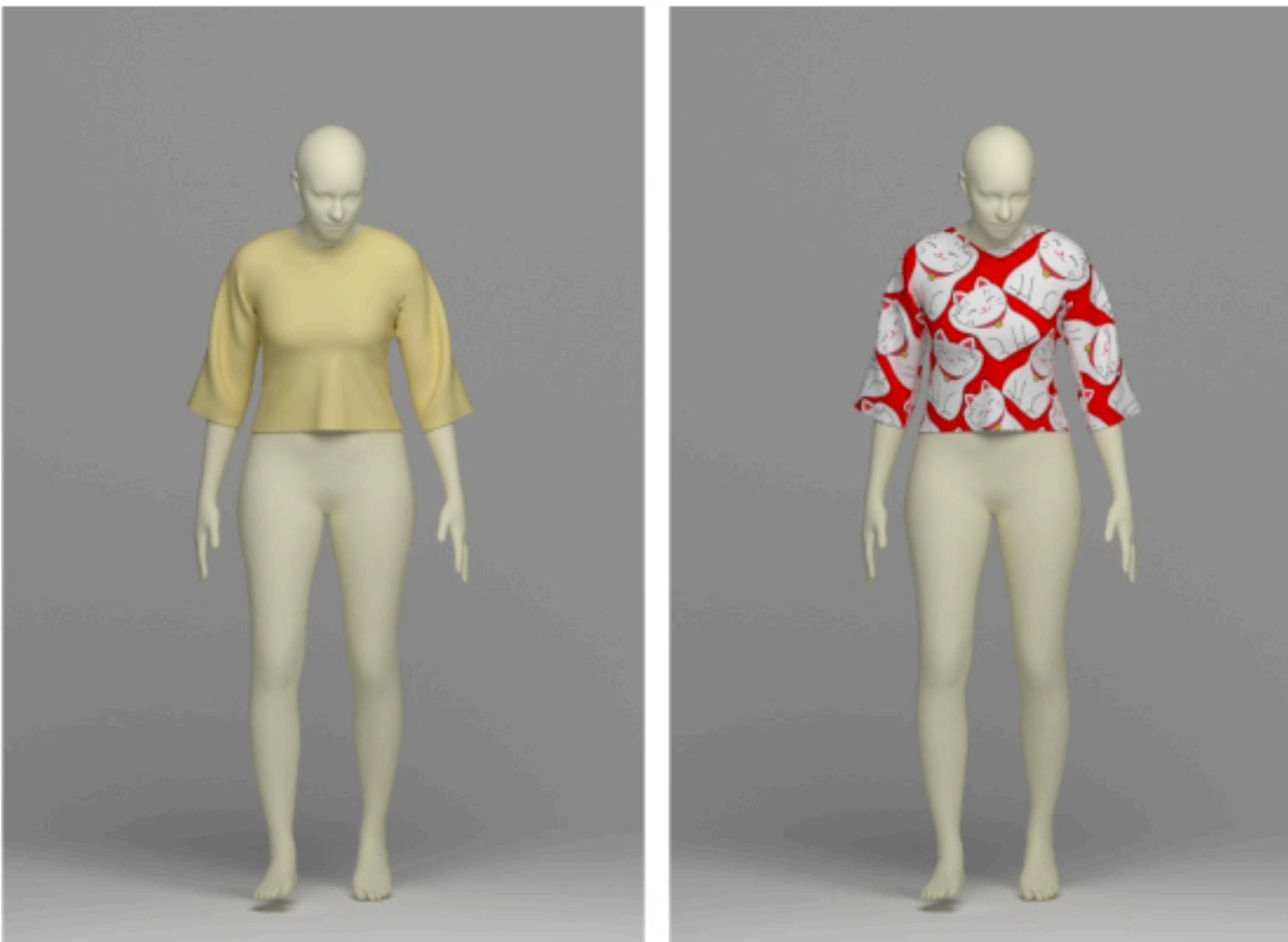
output (with and without texture):



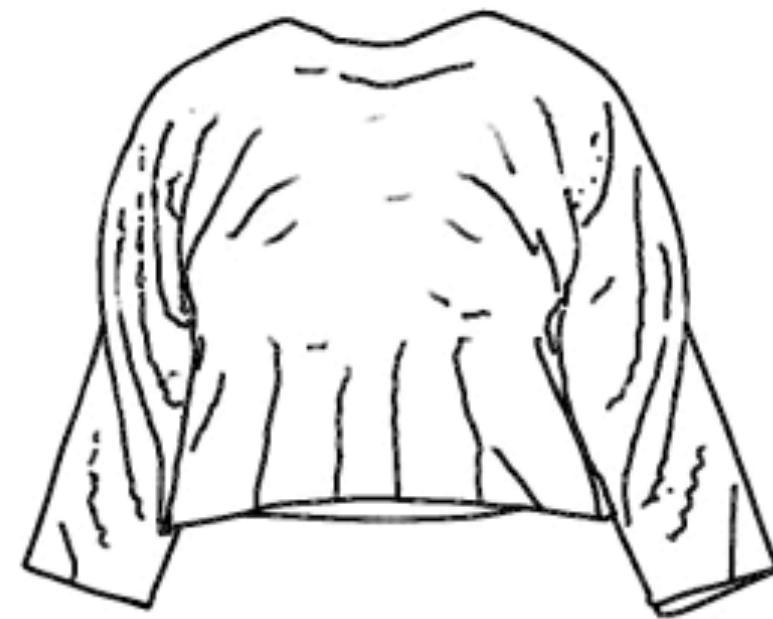
input sketch:



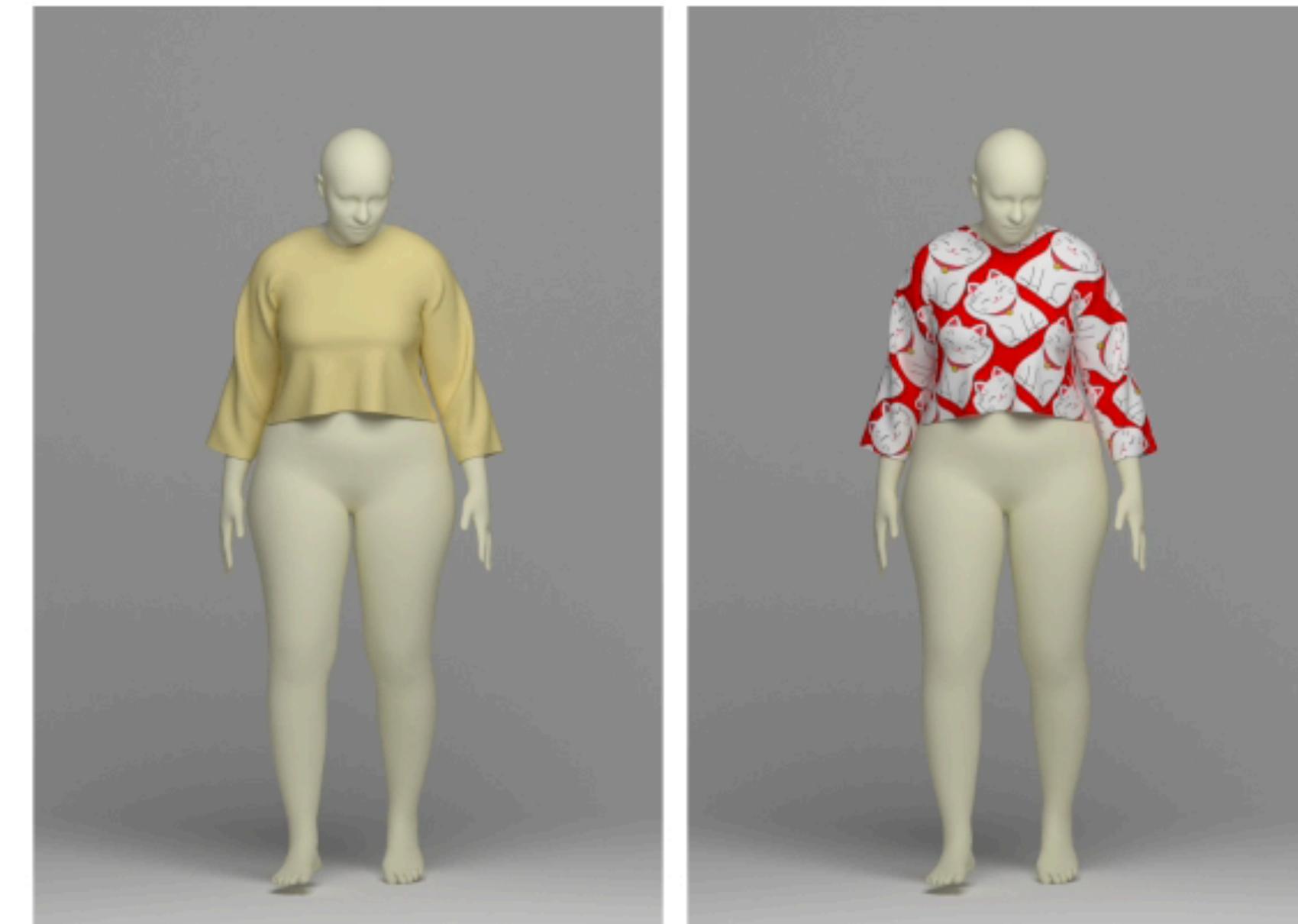
output (with and without texture):



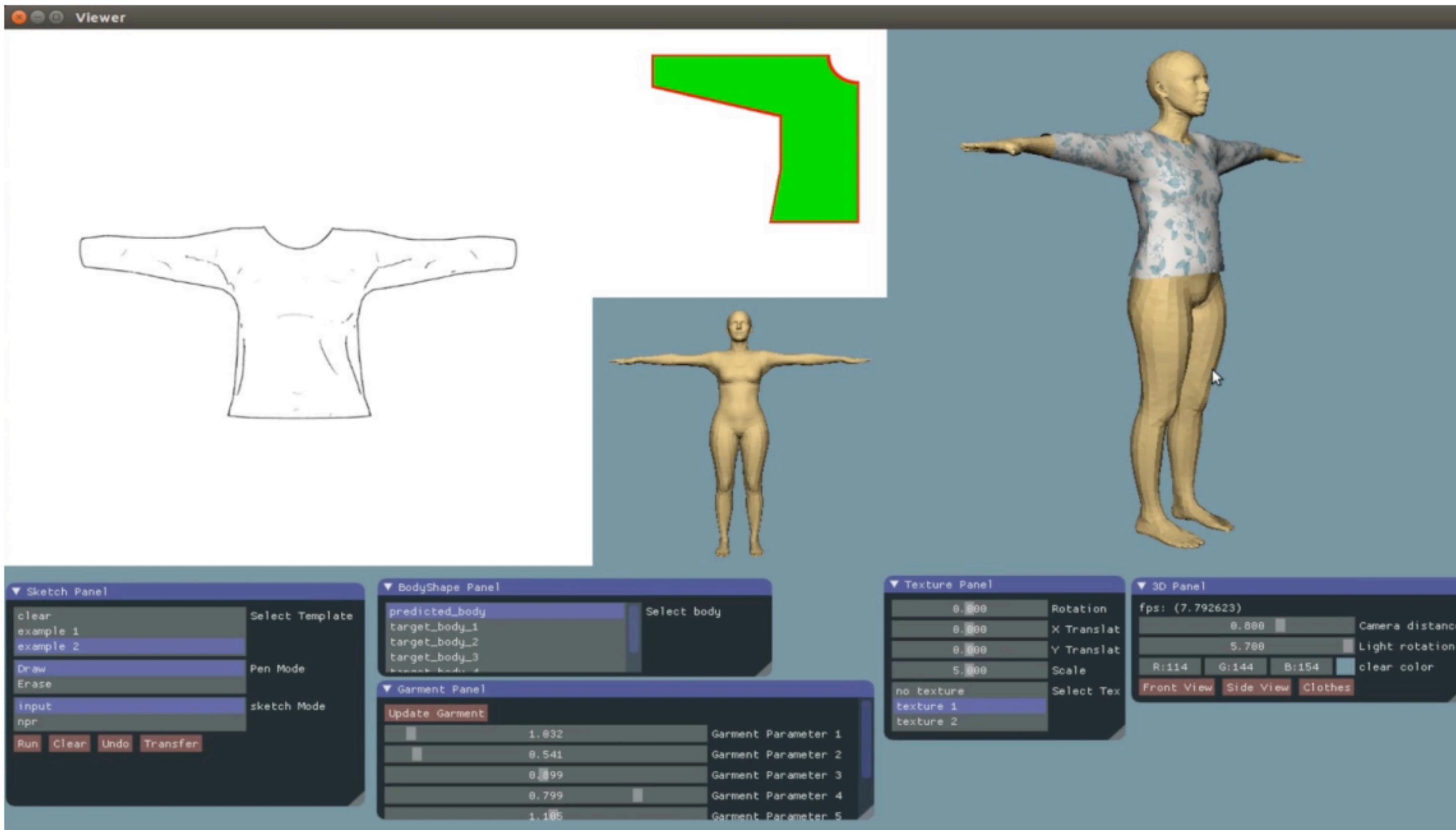
input sketch:



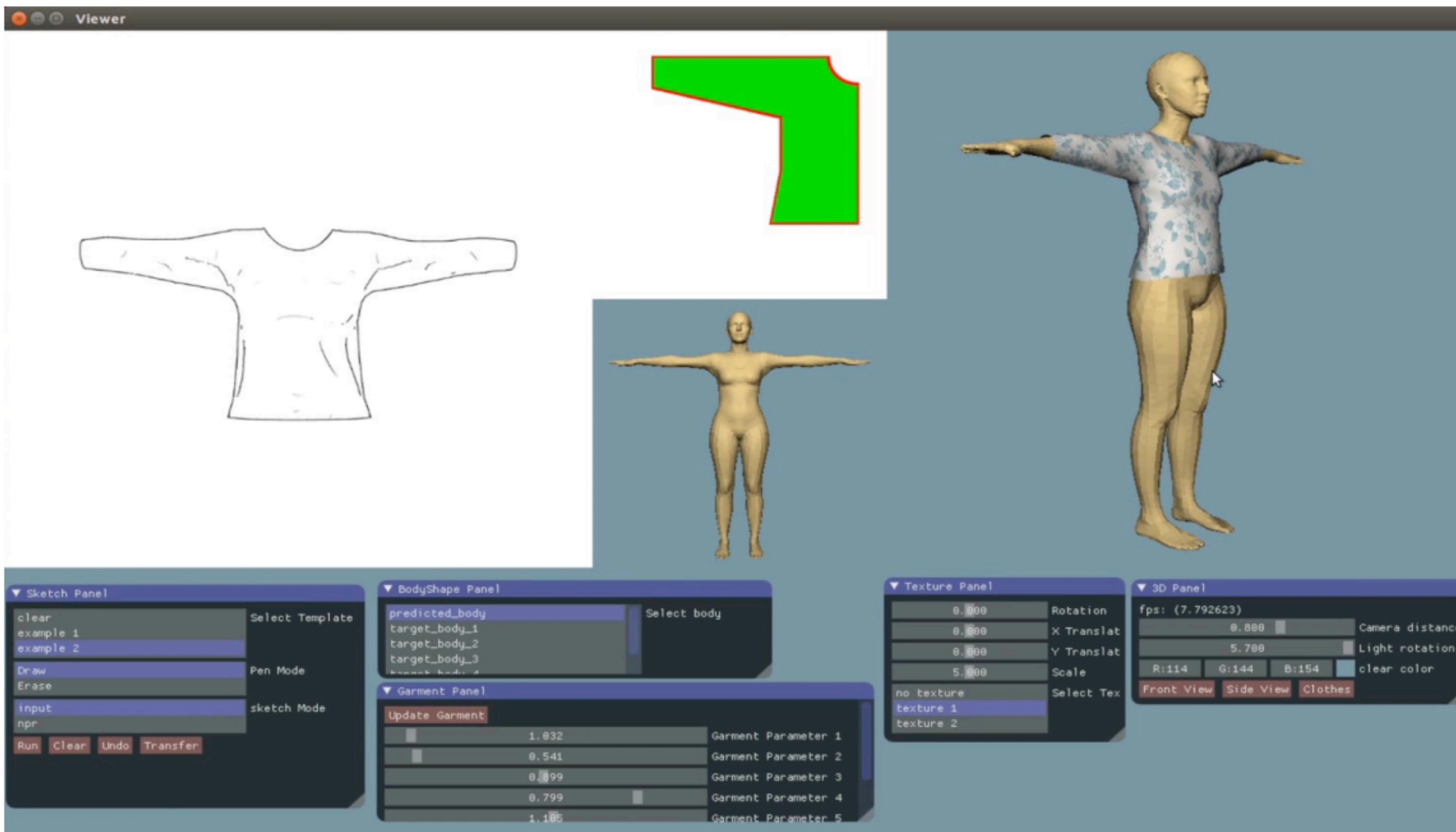
output (with and without texture):

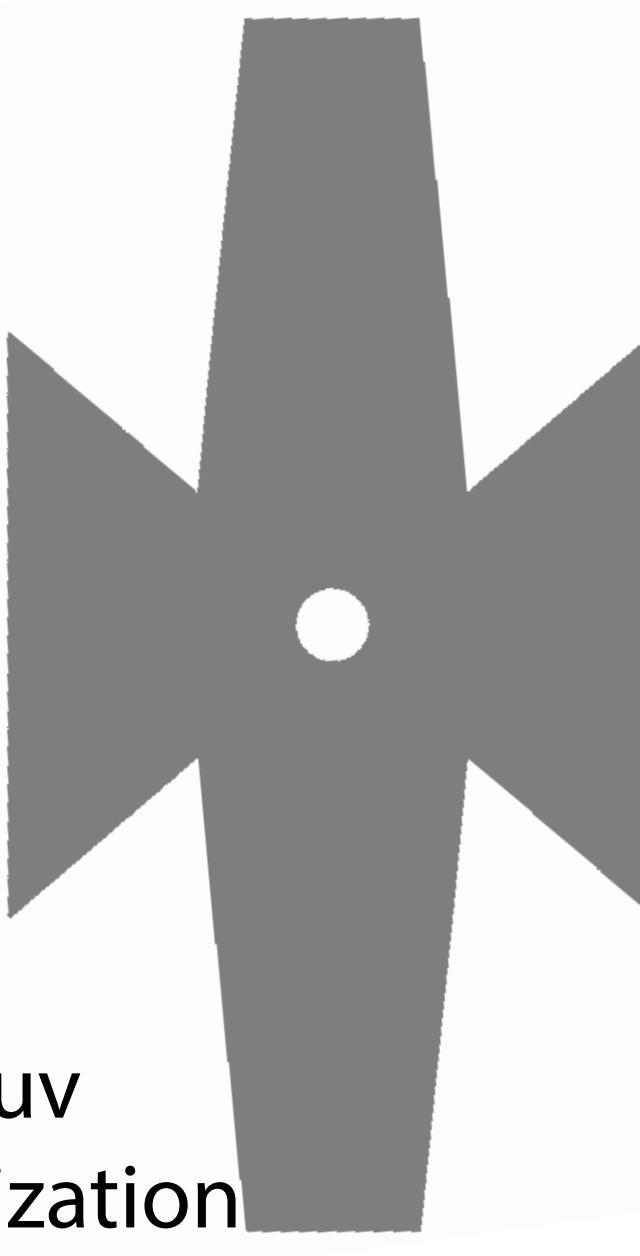


Retexturing:

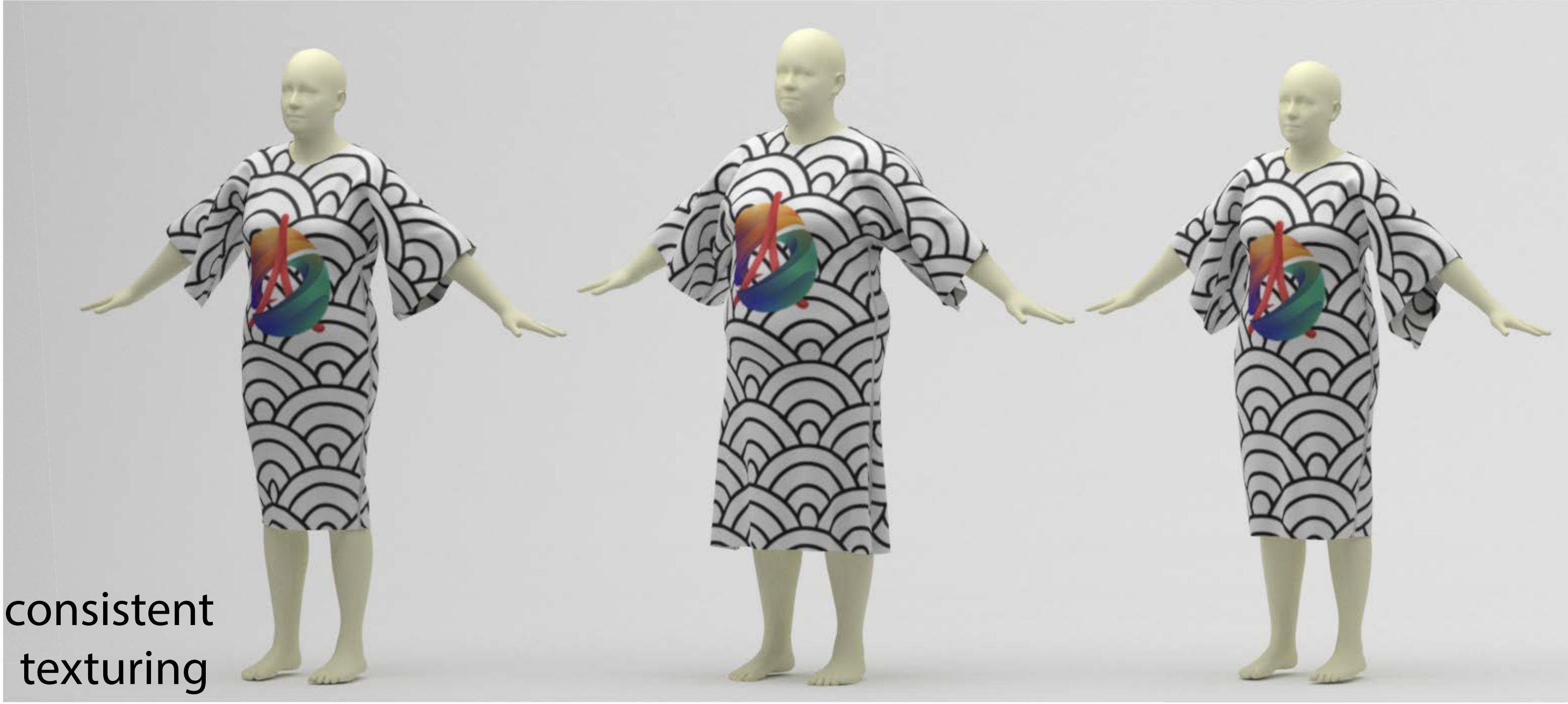


Retexturing:



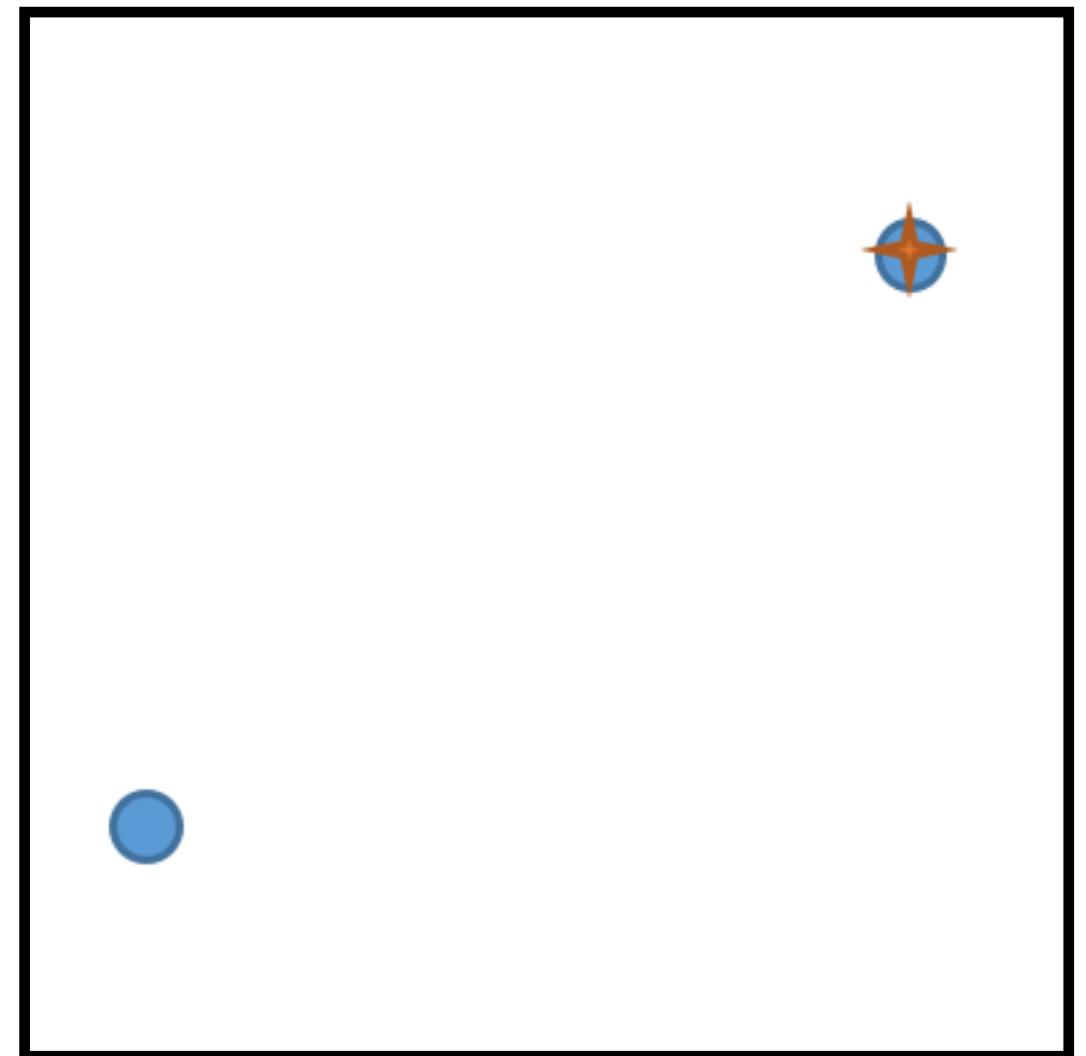
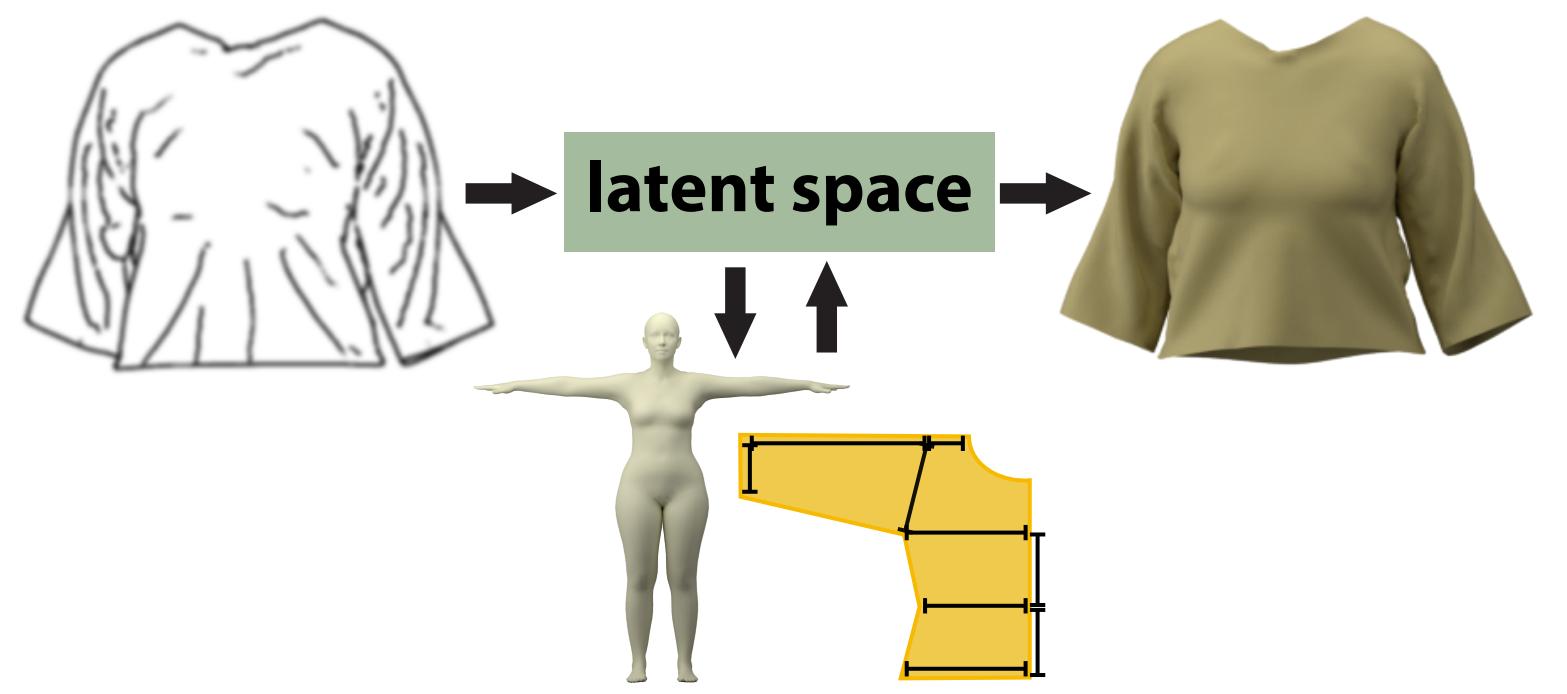


recovered uv
parameterization

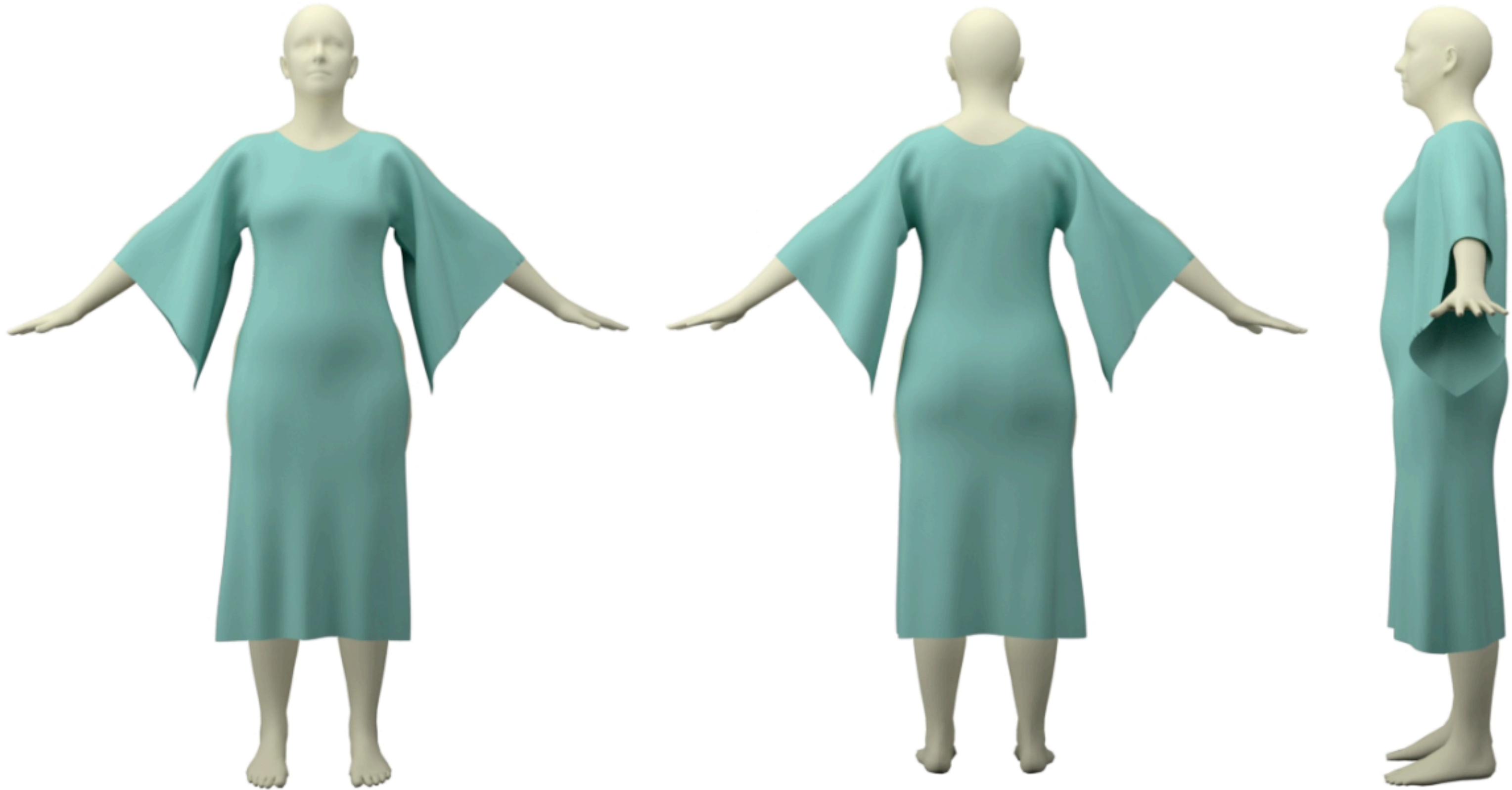


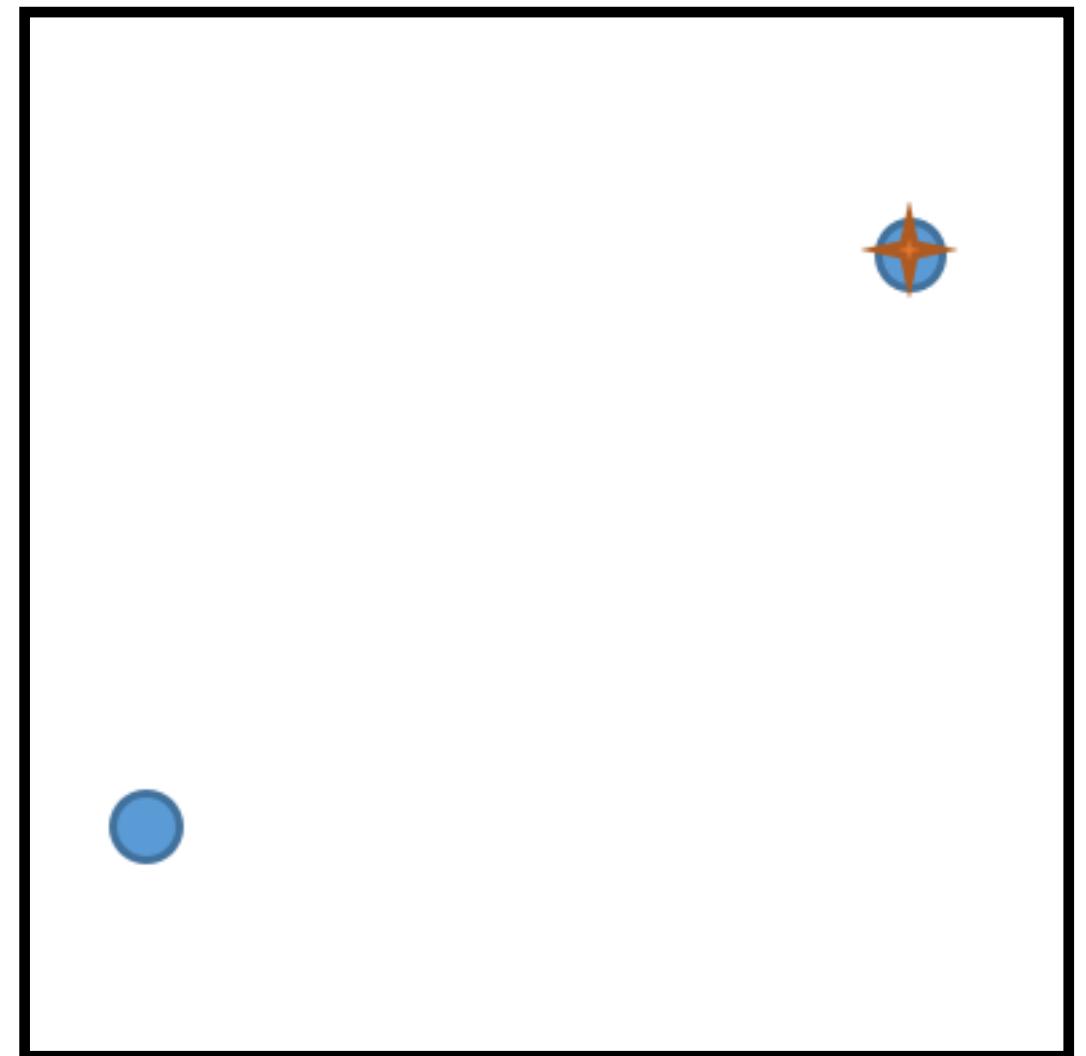
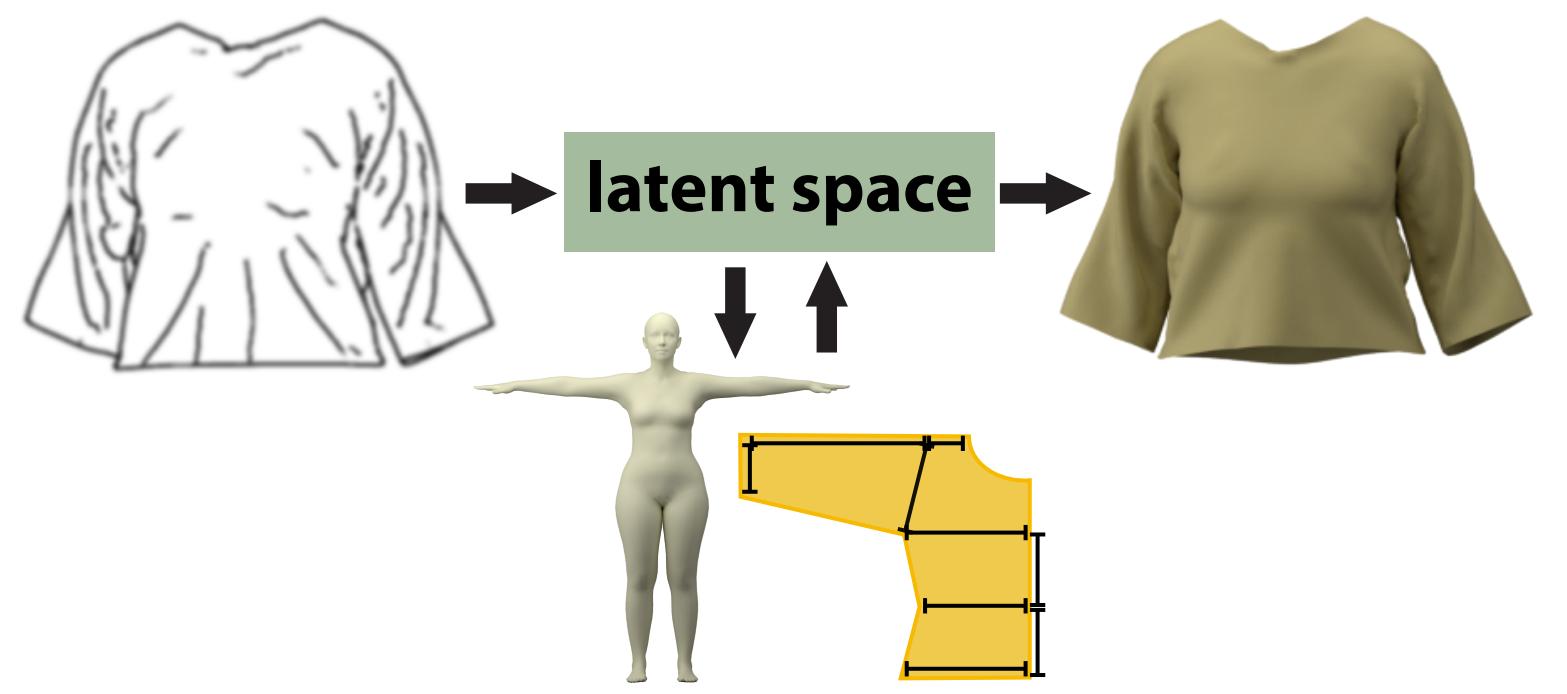
consistent
texturing



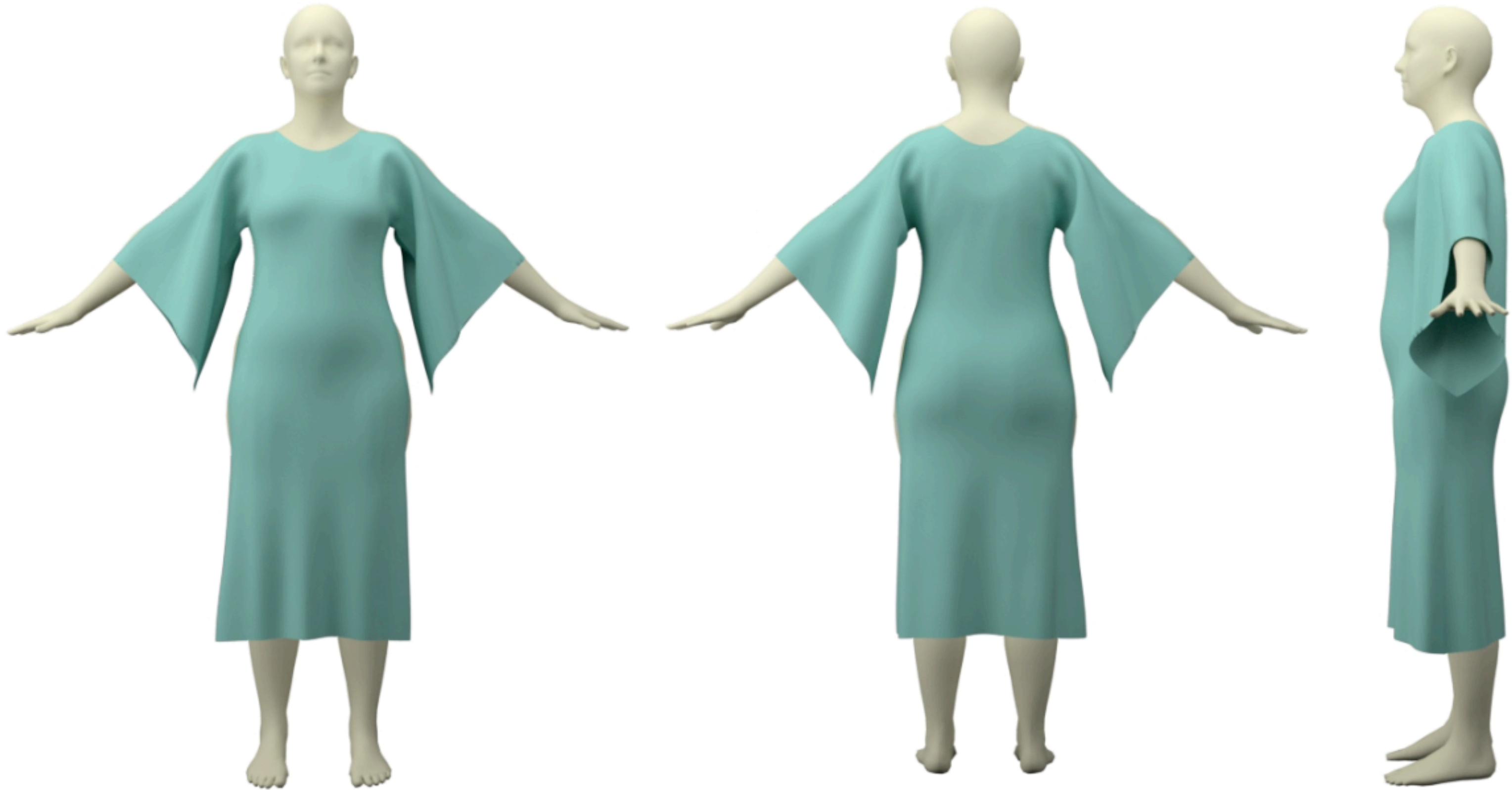


Latent Space



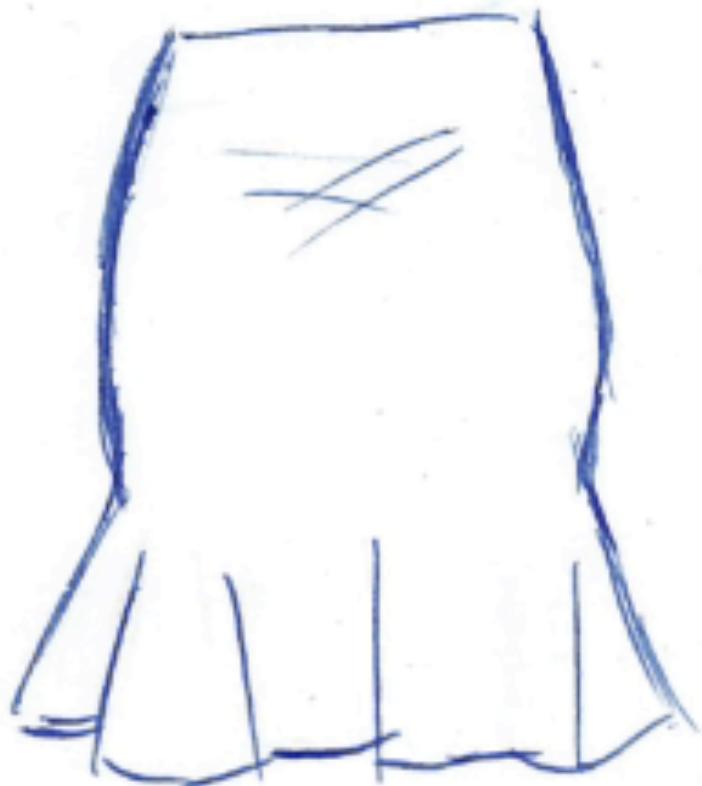


Latent Space

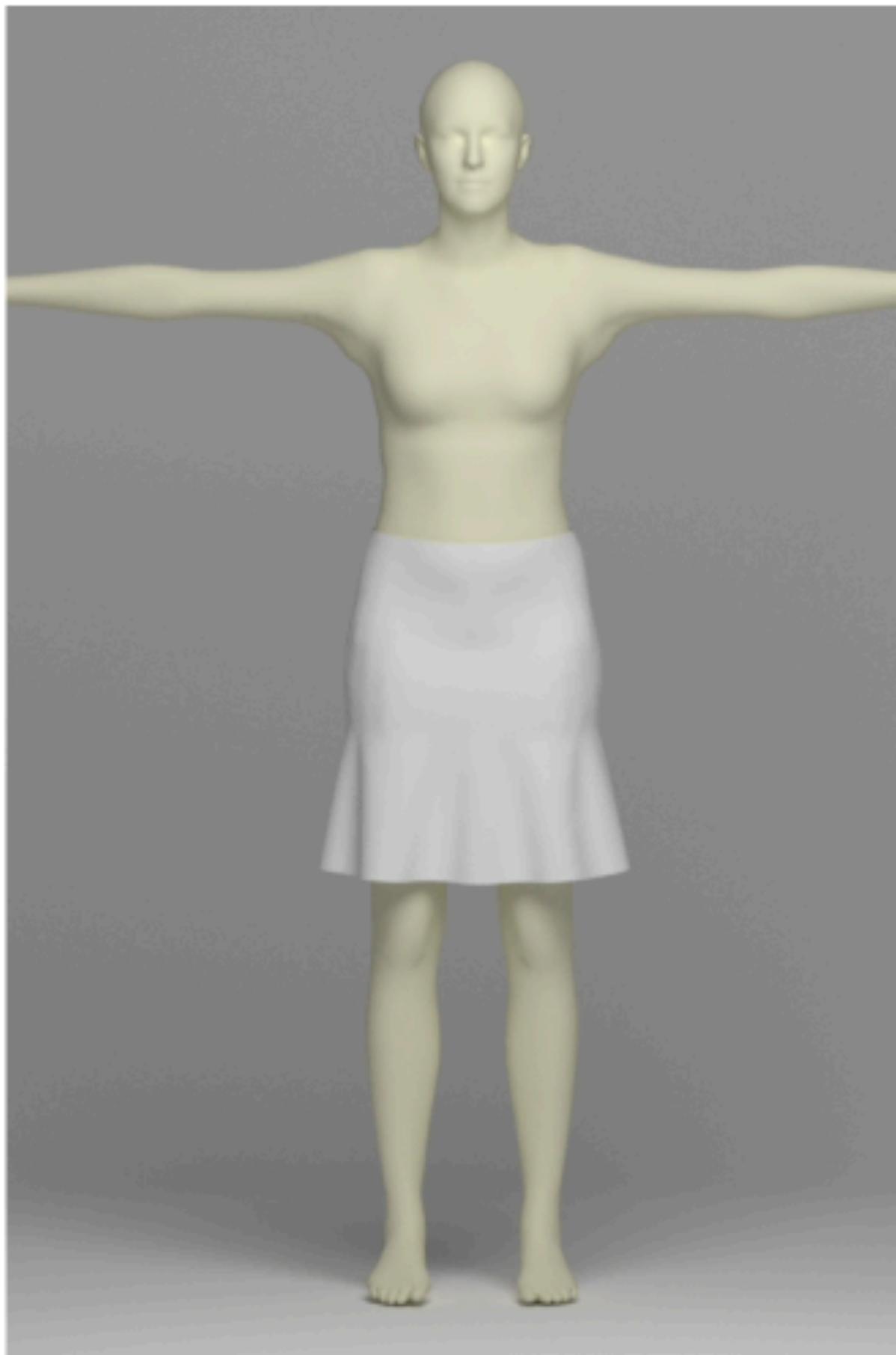




reference image



input sketch



output



reference image



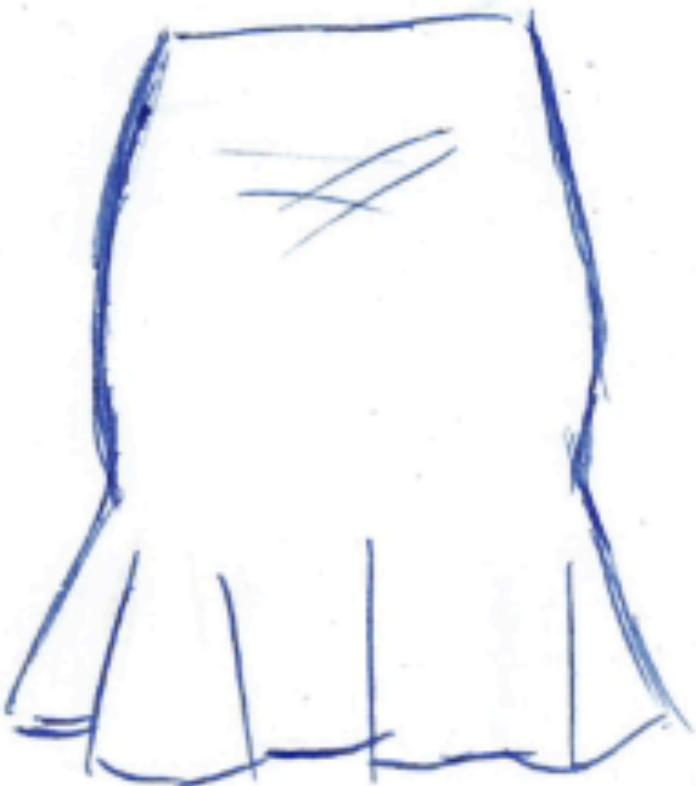
input sketch



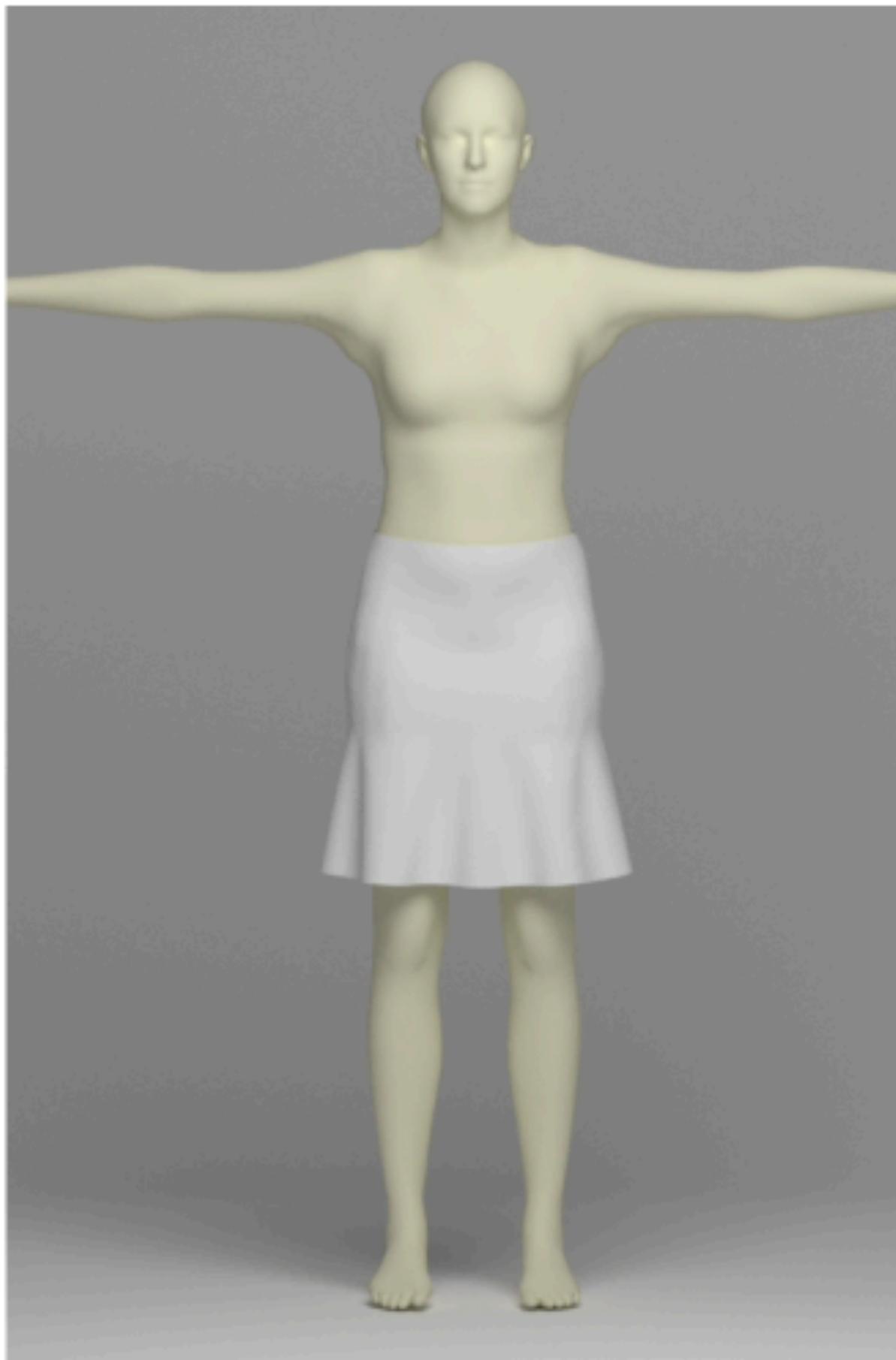
output



reference image



input sketch



output



reference image

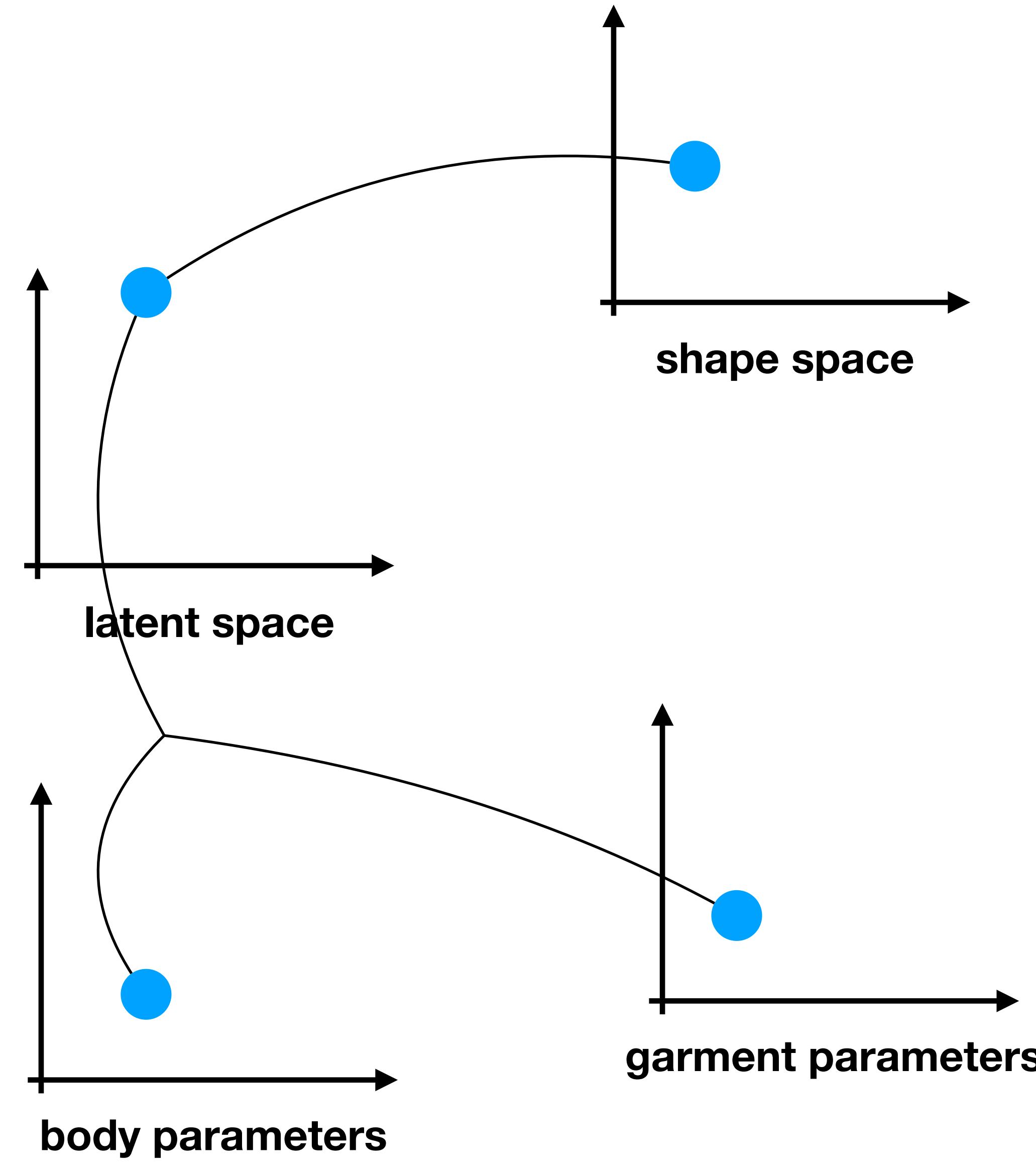


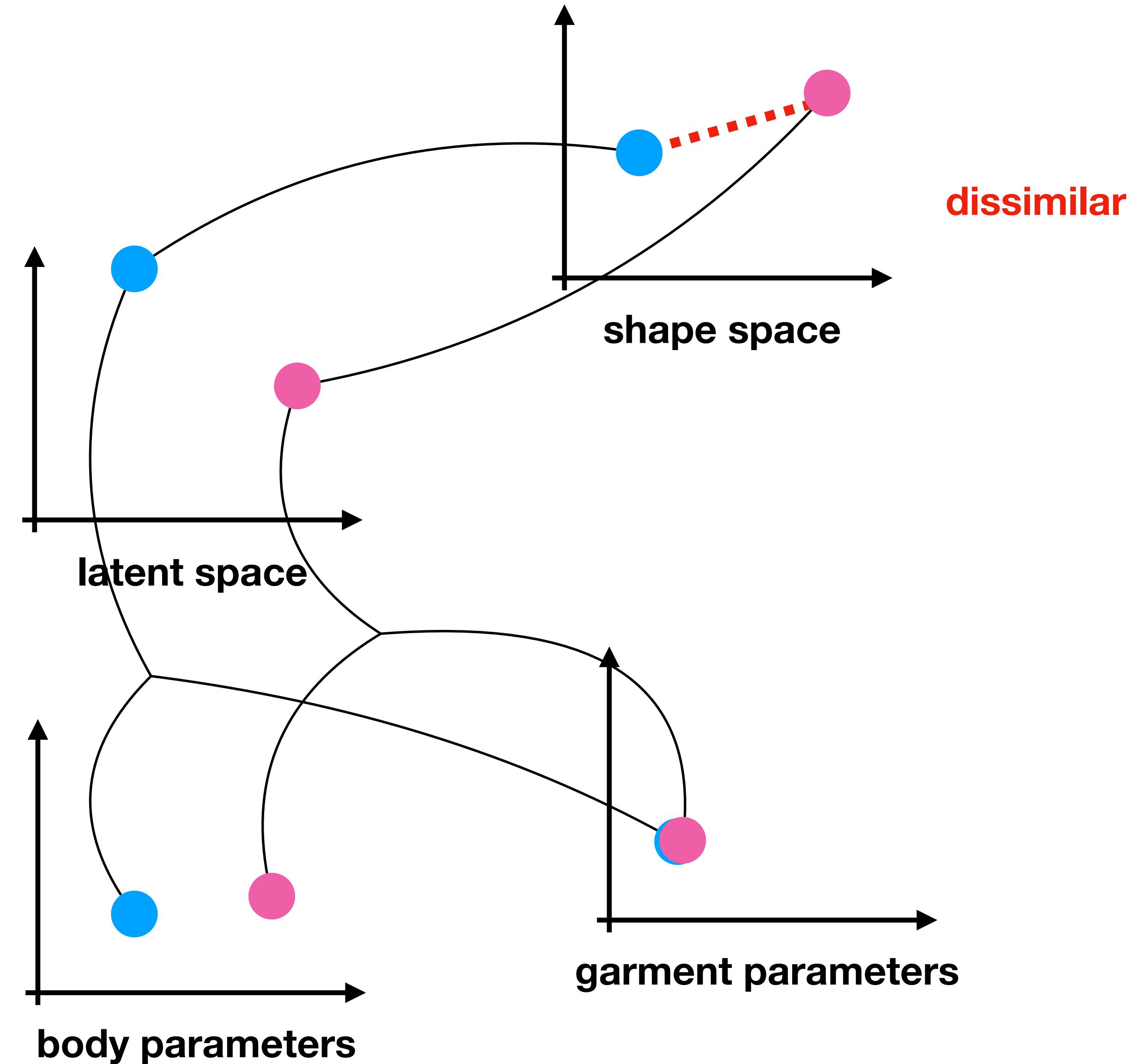
input sketch

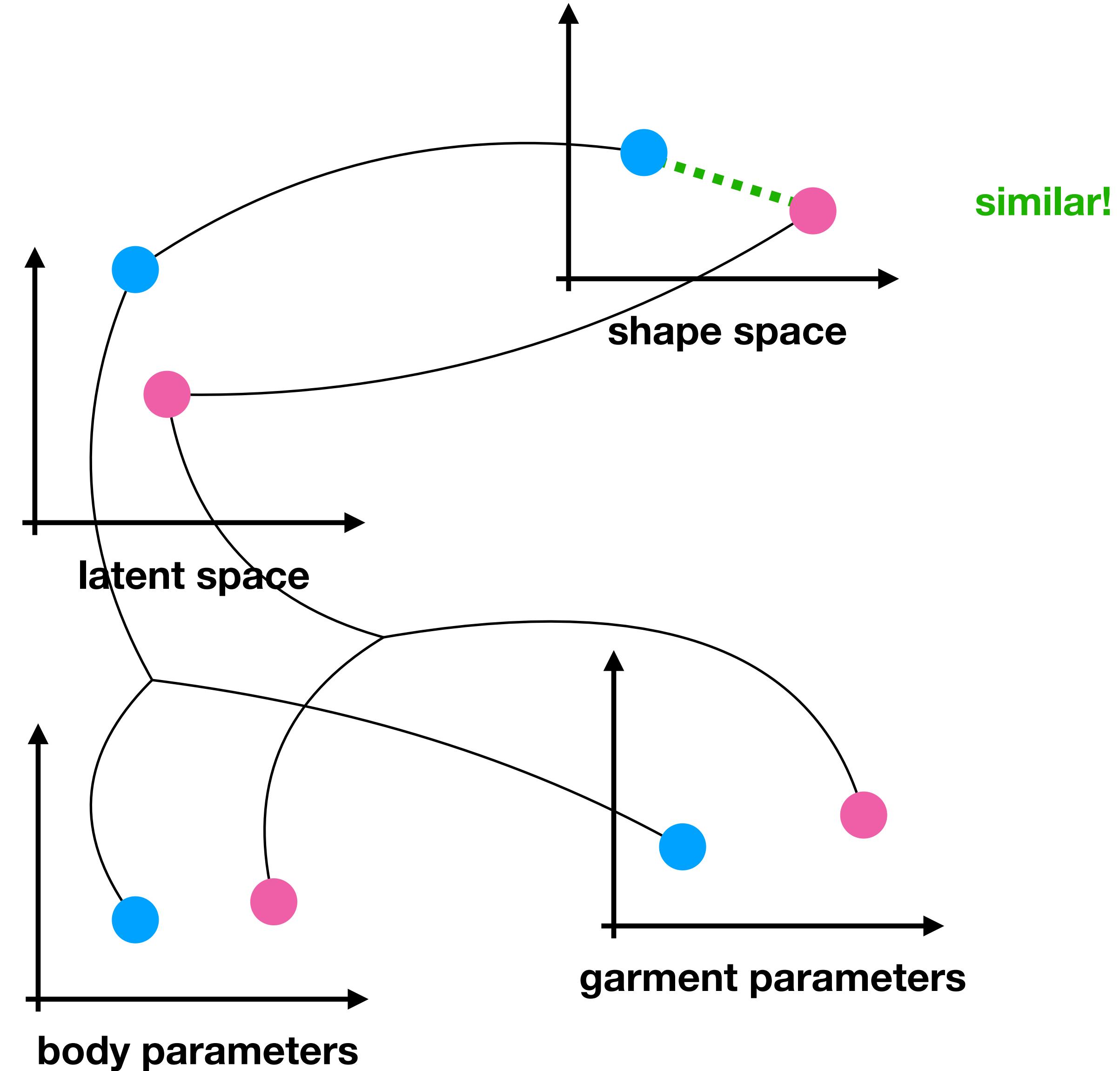


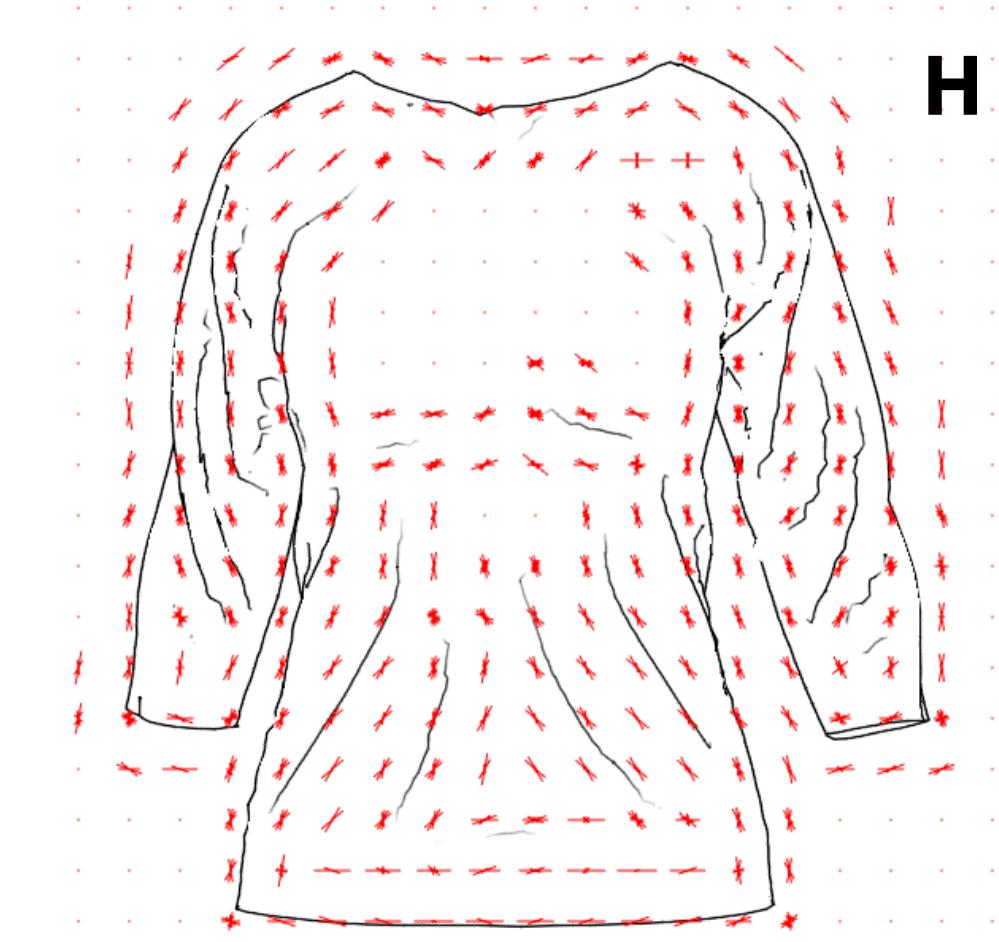
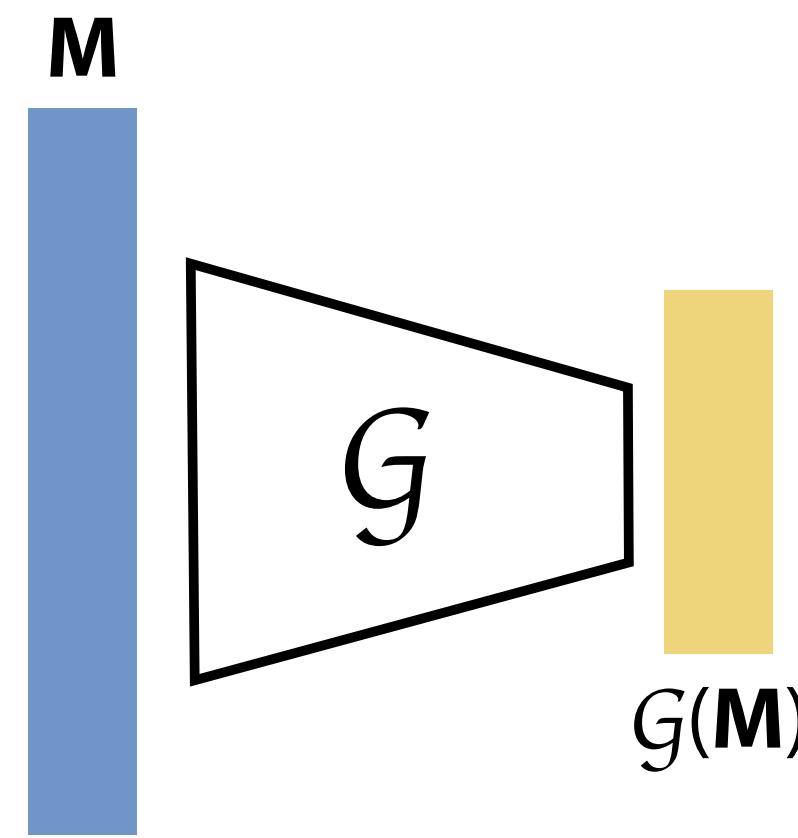
output



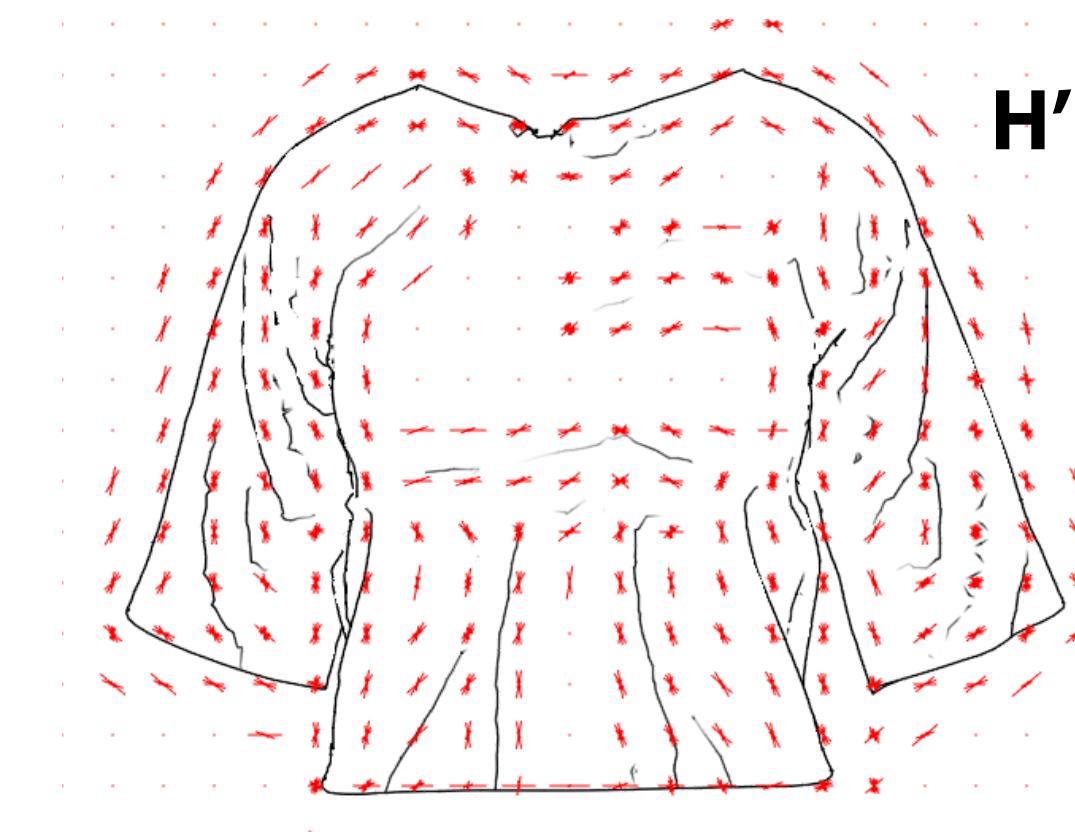
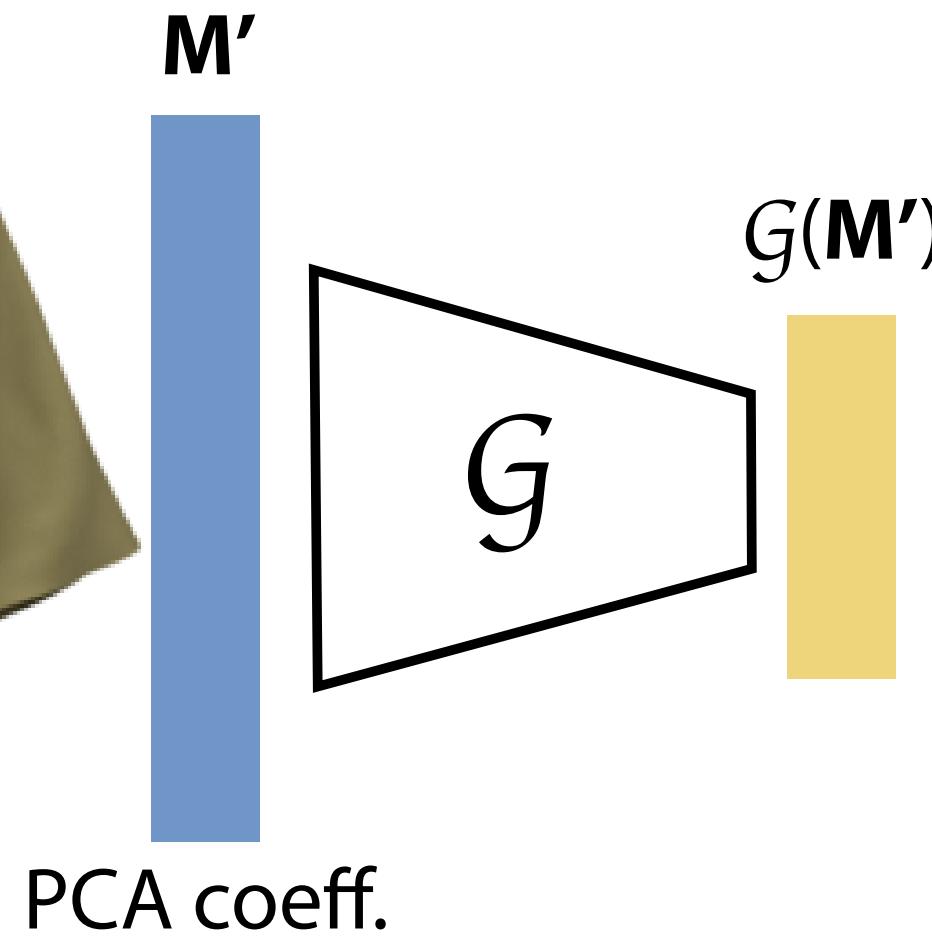






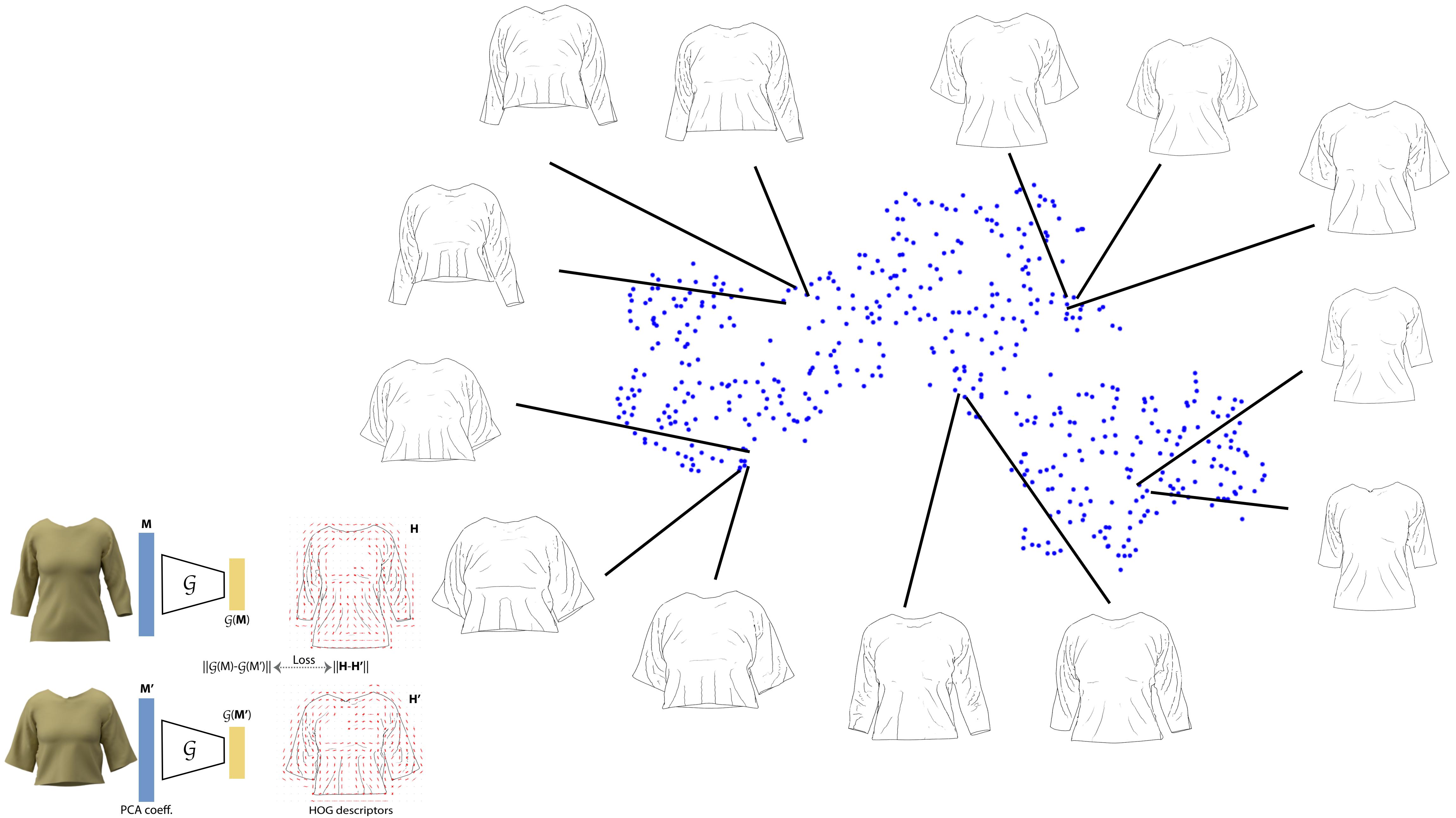


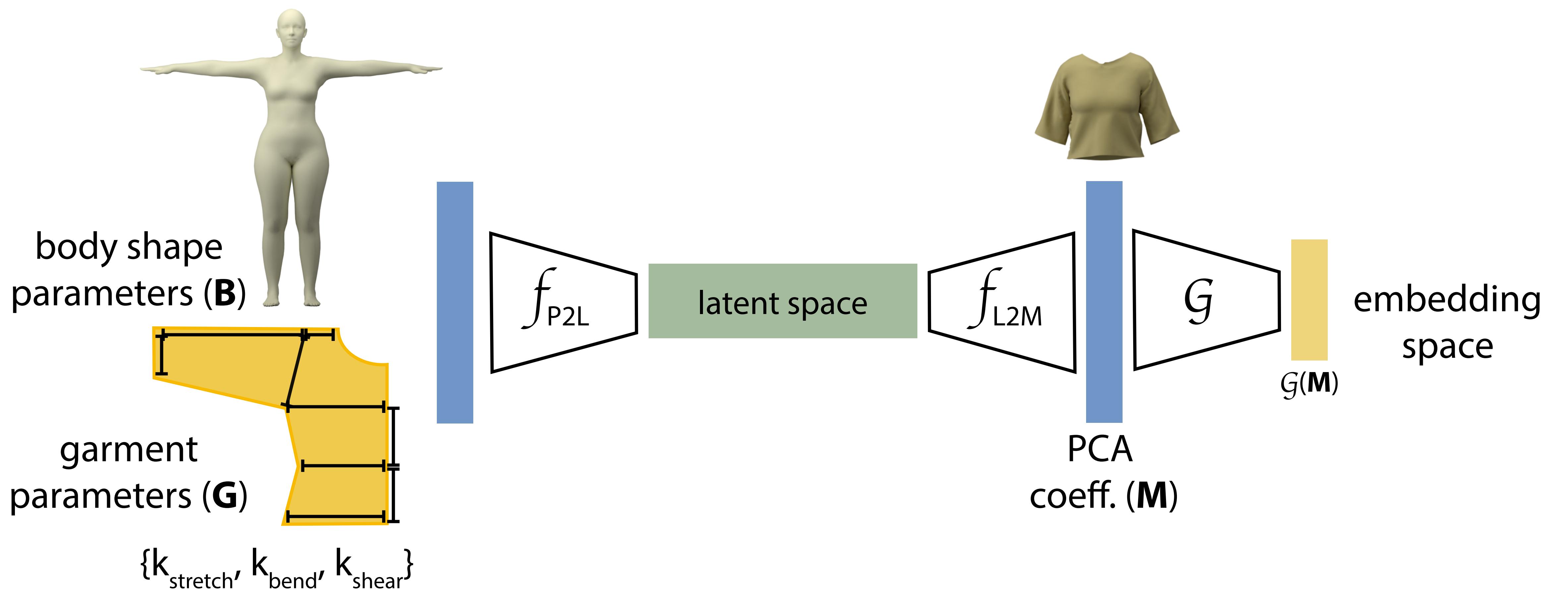
$$\|G(M) - G(M')\| \xleftarrow{\text{Loss}} \|H - H'\|$$

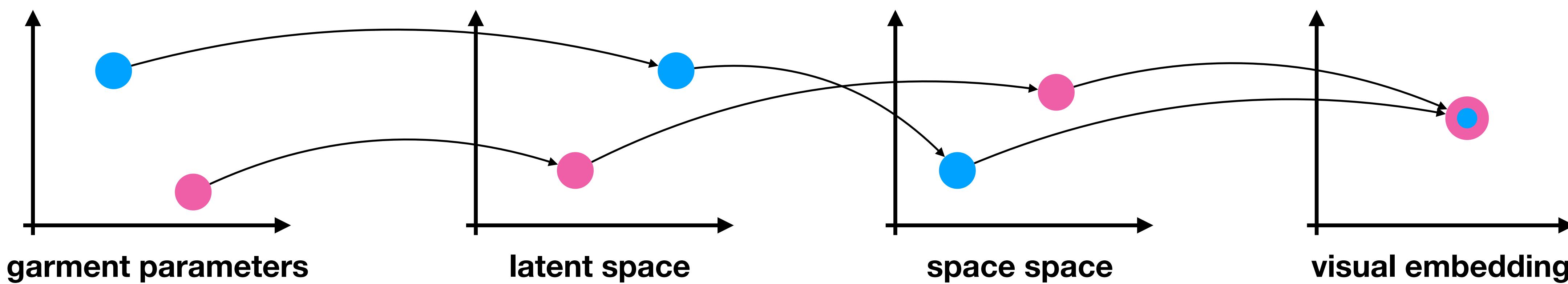
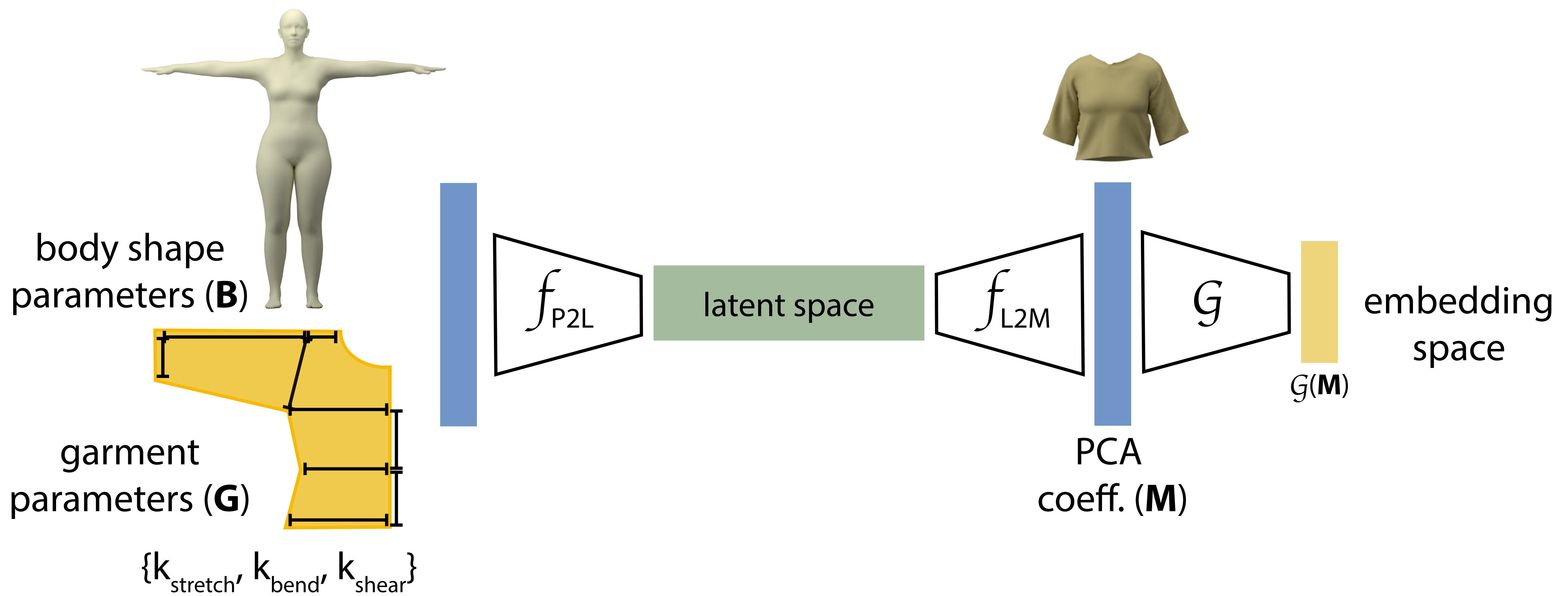


PCA coeff.

HOG descriptors

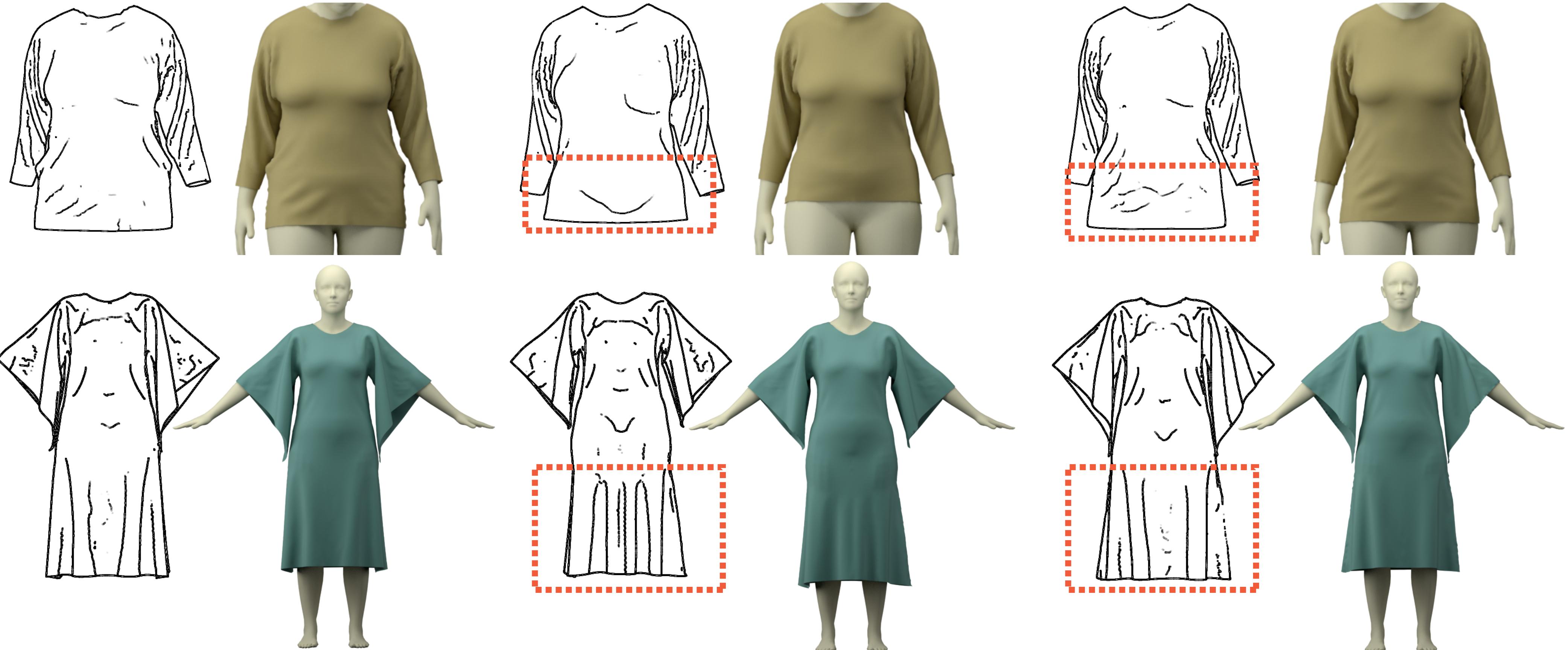






animation

animation

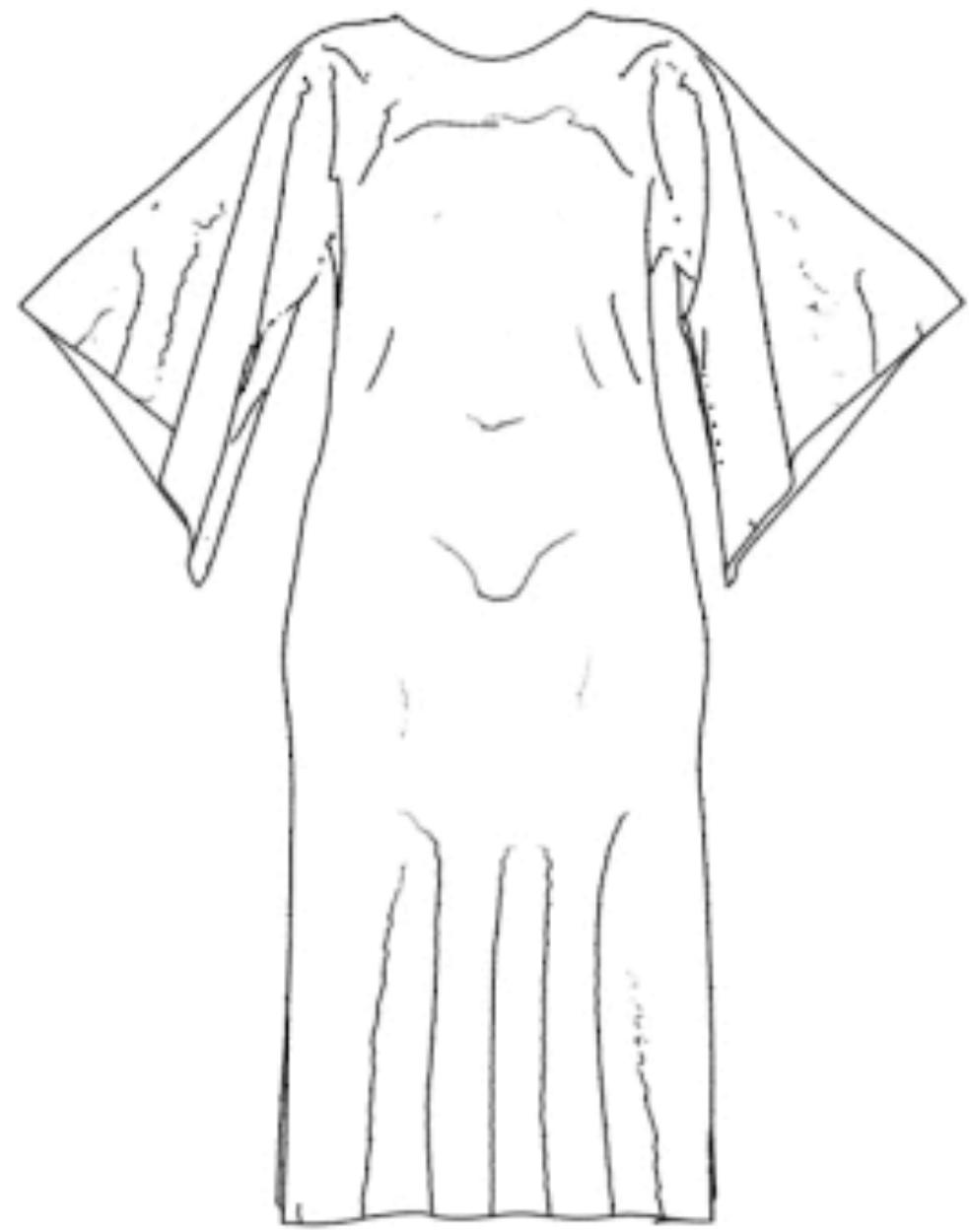


initial garment design (G)
on body (B)

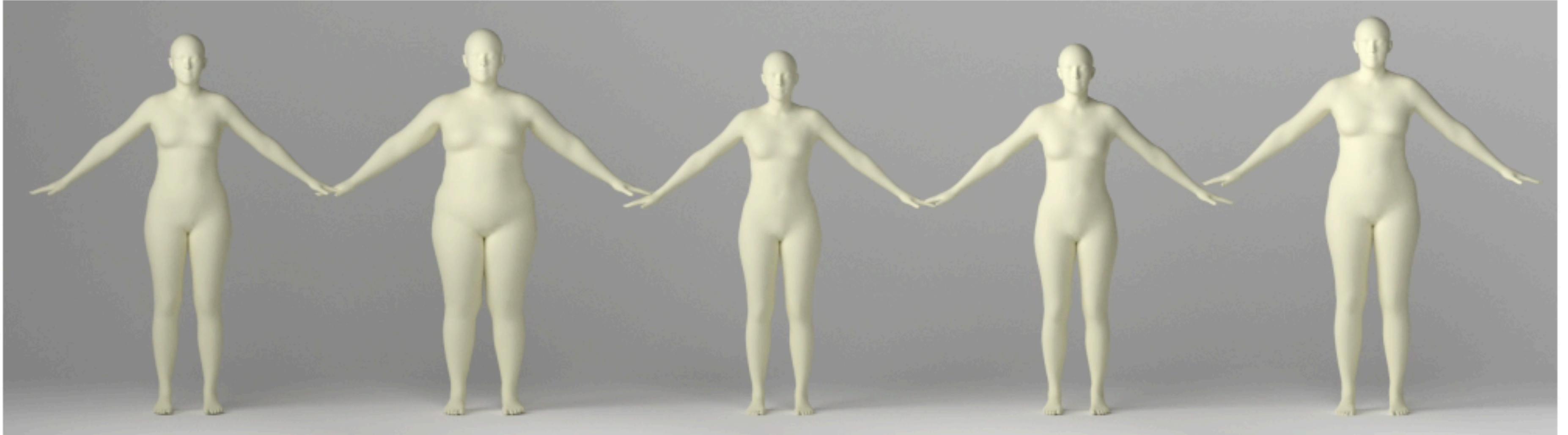
same garment (G) on a
different body (B')

retargetted garment (G')
on body (B')

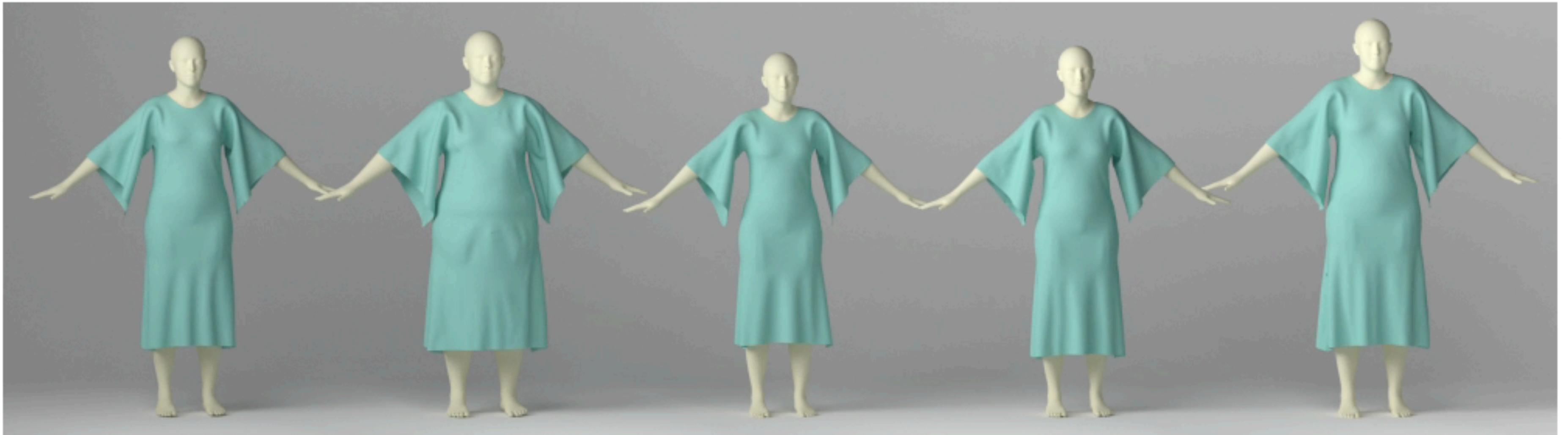
different body shapes



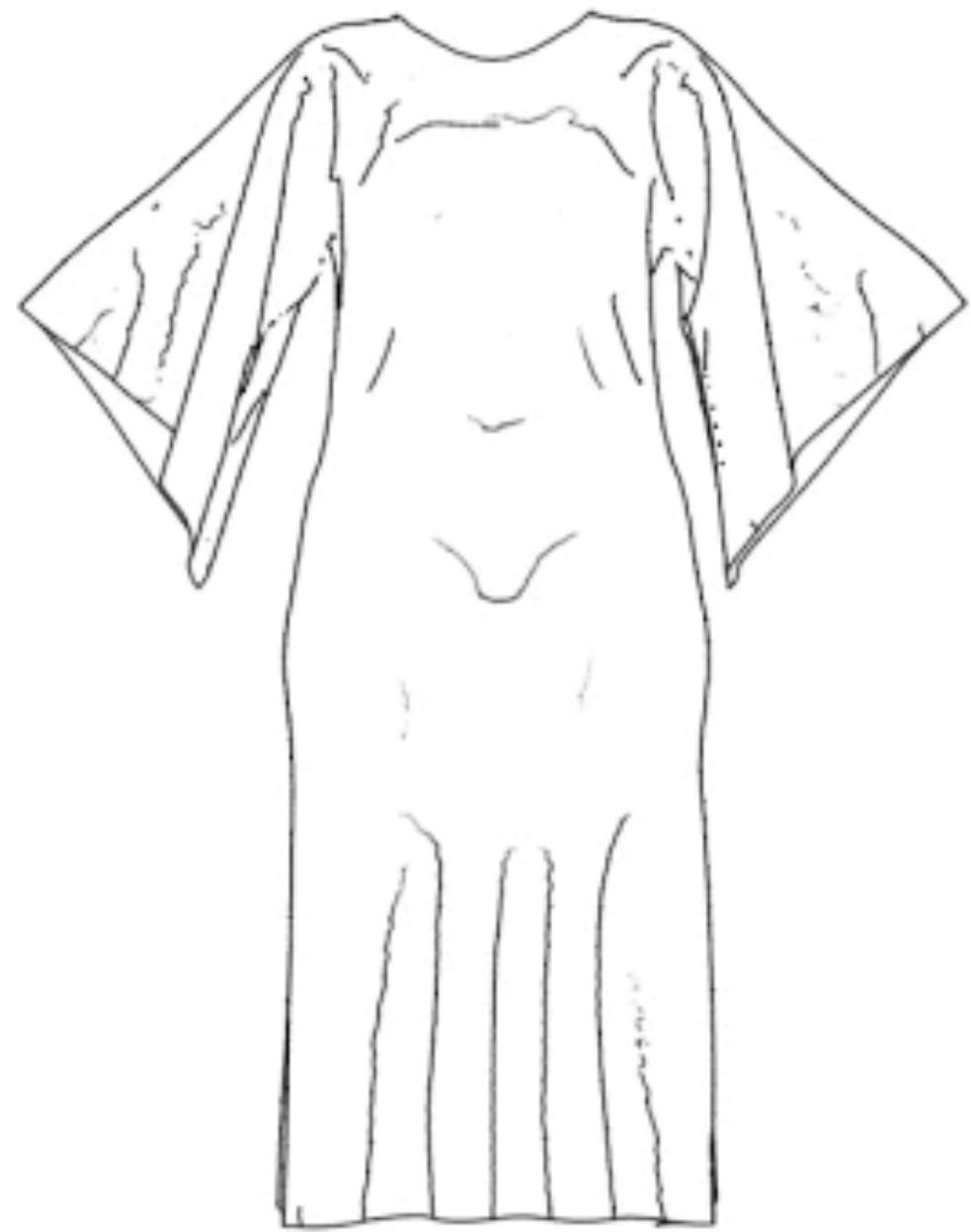
input
sketch



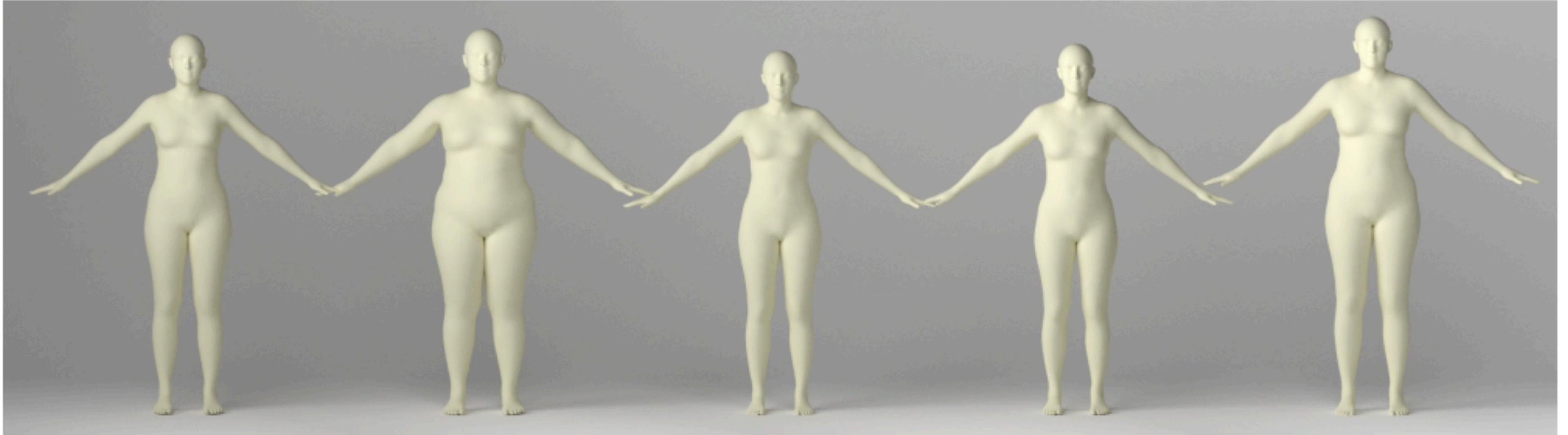
retargeting results



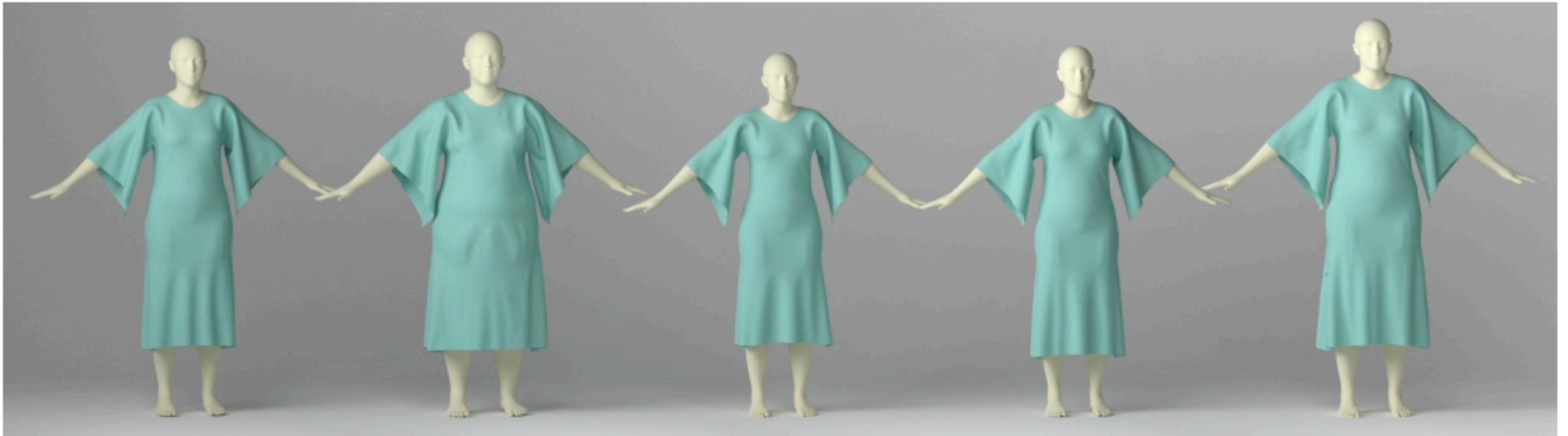
different body shapes



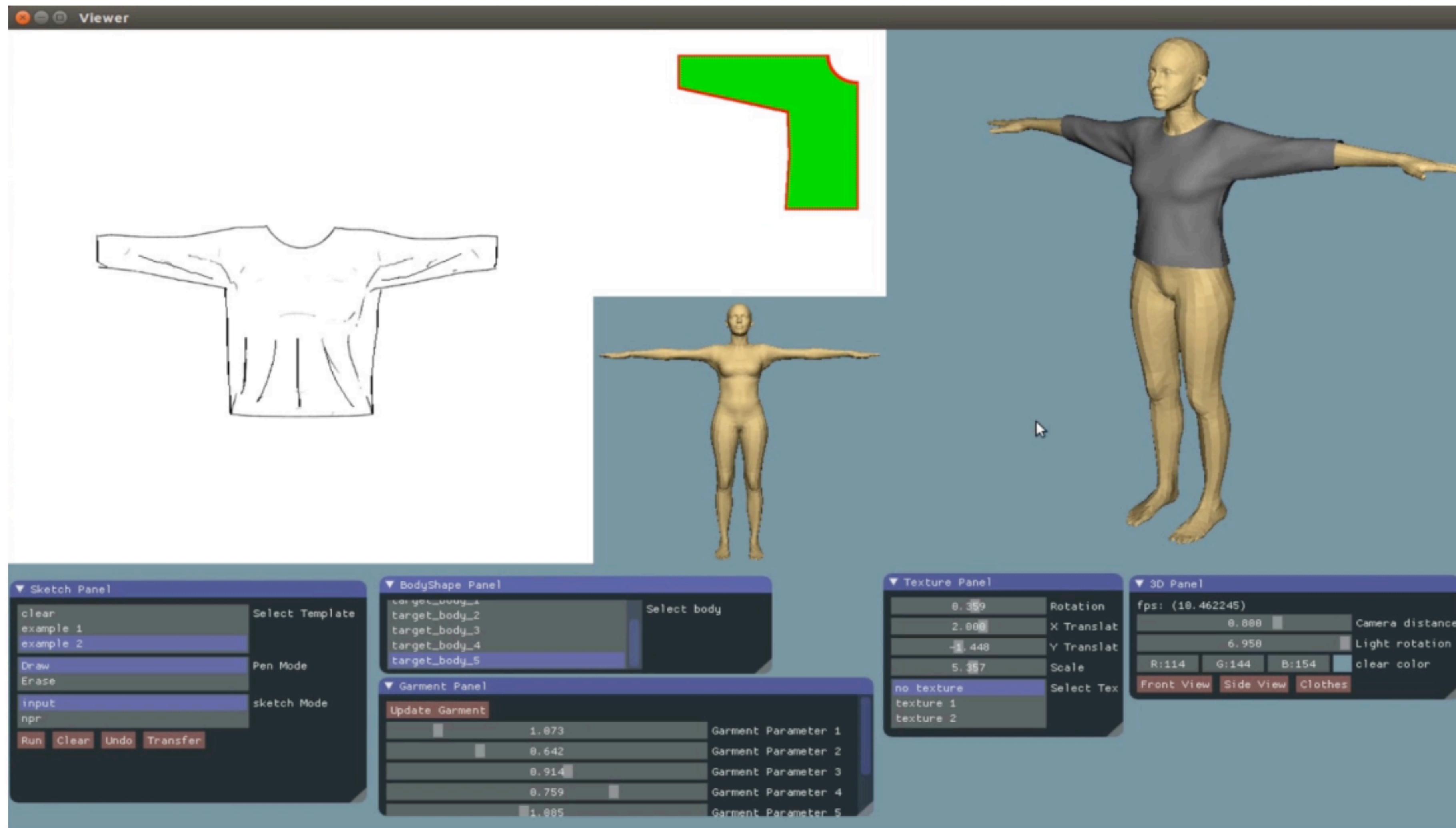
input
sketch



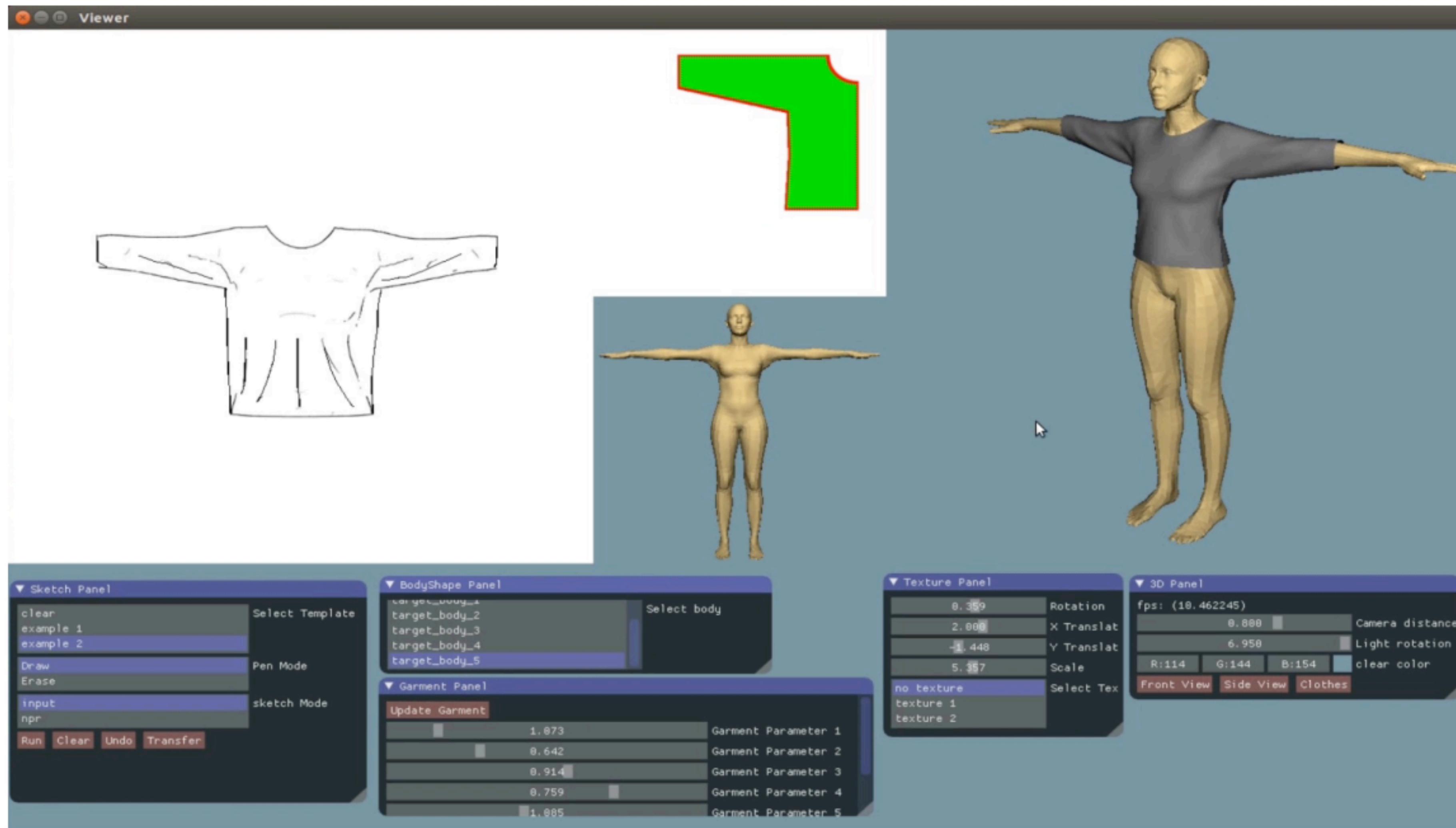
retargeting results



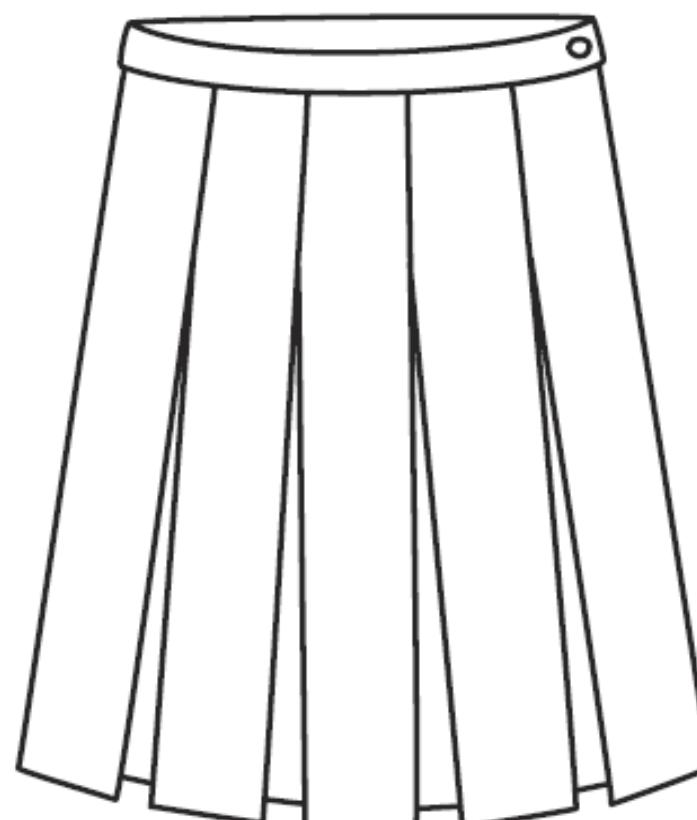
Draping the current garment on different body shapes:



Draping the current garment on different body shapes:



Limitations



A failure case

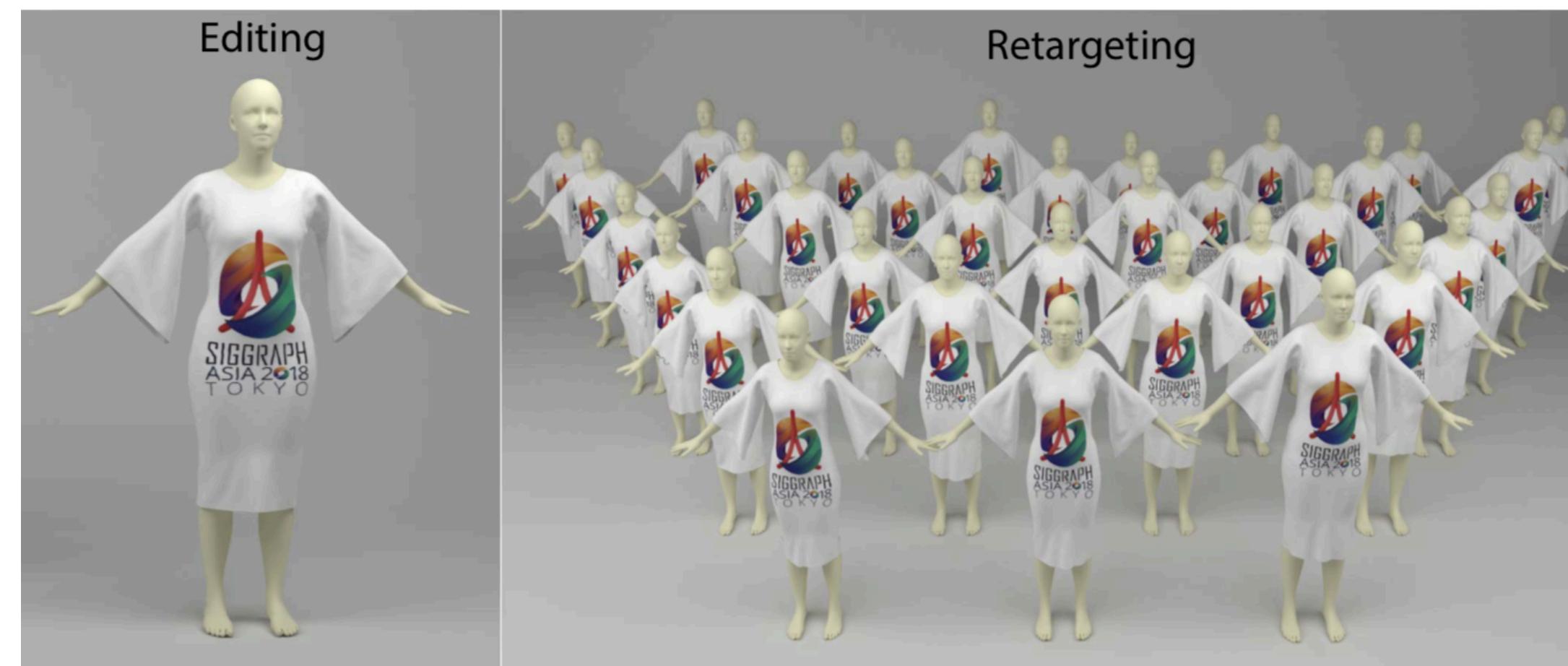
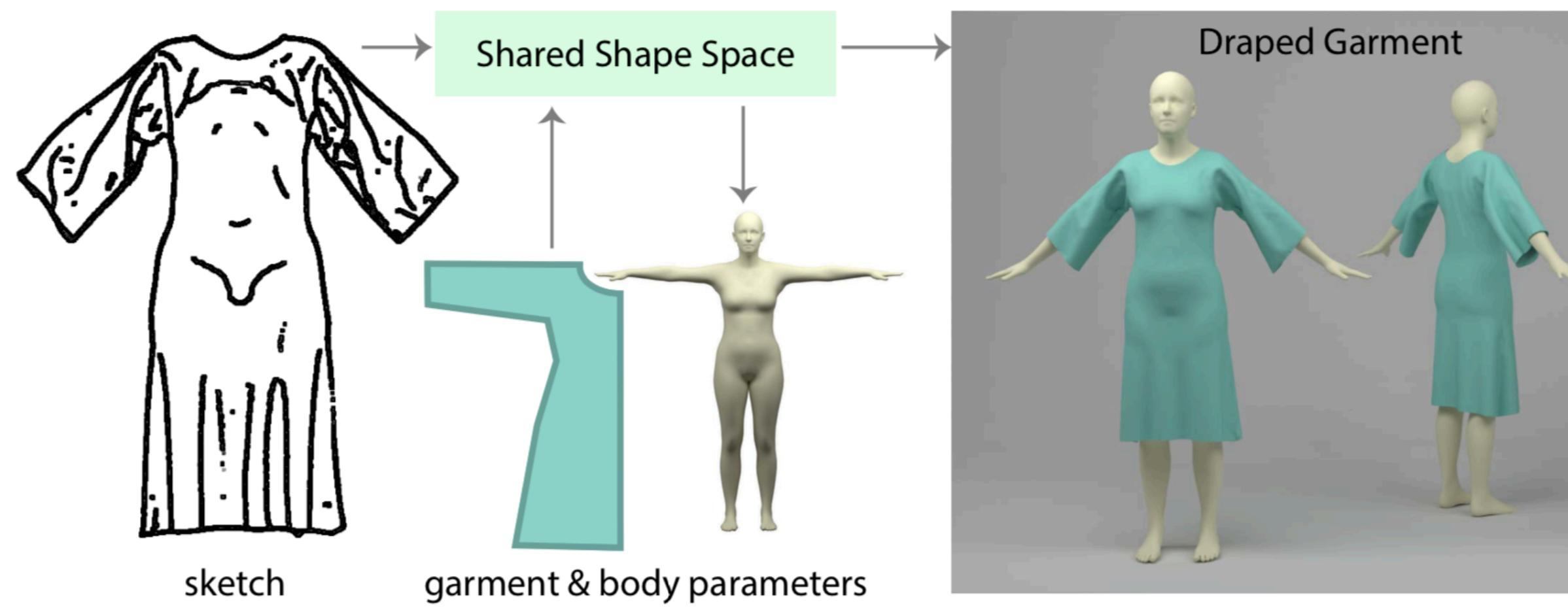
Future work

input sketch



our result





Microsoft®
Research



The Rabin Ezra
SCHOLARSHIP TRUST



Thank you!