StyleBlit: Fast Example-Based Stylization with Local Guidance (supplementary material)
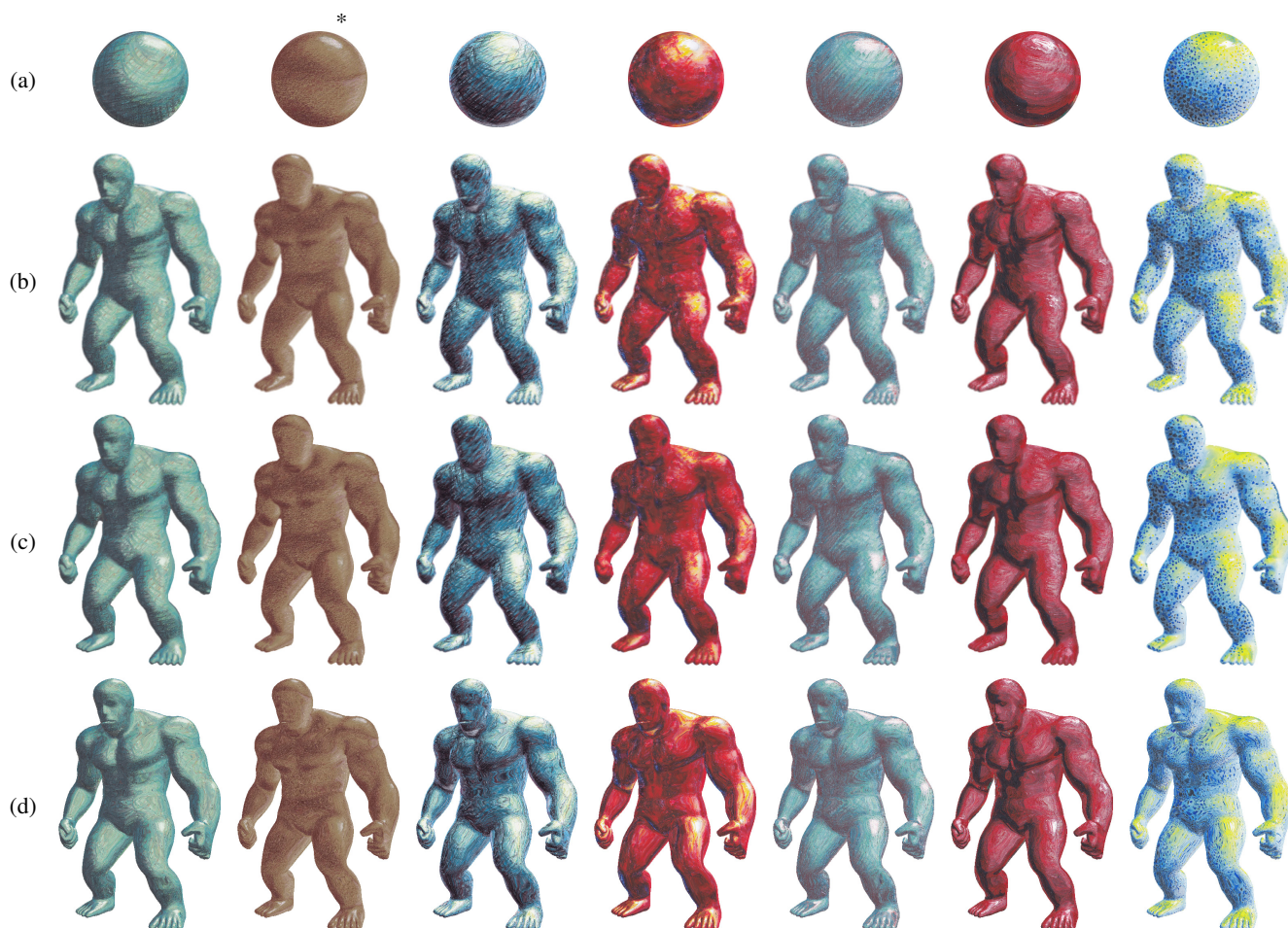

Figure 1: *Comparison with StyLit [FJL*16] and The Lit Sphere [SMGG01] (normal-based guidance): style exemplar (a), our approach (b), StyLit (c), and The Lit Sphere (d). Style exemplars:* © Pavla Sýkorová *and* Daichi Ito*

1. Introduction

In this supplementary material we present pseudocode of the brute-force StyleBlit algorithm (Algorithm 1), additional results of our method, and a description of perceptual study we conducted in order to evaluate visual quality of our results (see Section 2).

In Fig. 1 we copmare our approach with StyLit [FJL*16] and The Lit Sphere [SMGG01] in the scenario where normals are used for guidance. Additional results comparing our approach with StyLit are presented also in Figures 2, 3, 4, and 5. More results for normal-based guidance are presented in Figures 6, 7, and 8 where our approach has been applied to CAD model. Fig. 9 further compares our

method with texture mapping for both scenarios presented in the main paper, i.e., when the style exemplar is drawn on a 2D projection of a 3D model and on a planar unwrap of this model. For this scenario an example of guiding channels is presented in Fig. 11. Finally, a reference result of neural-based style transfer is demonstrated in Fig. 13 and in Fig. 10 additional comparison with FaceStyle [FJS*17] is presented together with an example of corresponding guiding channels in Fig. 12.

Figure 2: *Comparison with StyLit [FJL*16] (normal-based guidance): our approach (first row), StyLit (second row).*
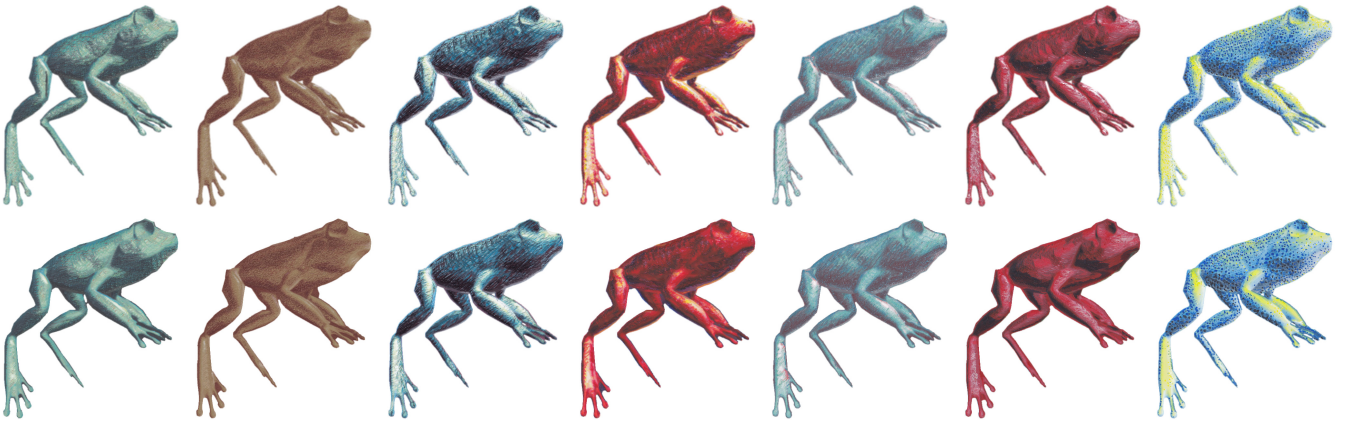

Figure 3: *Comparison with StyLit [FJL*16] (normal-based guidance): our approach (first row), StyLit (second row).*

Figure 4: *Comparison with StyLit [FJL*16] (normal-based guidance): our approach (first row), StyLit (second row).*
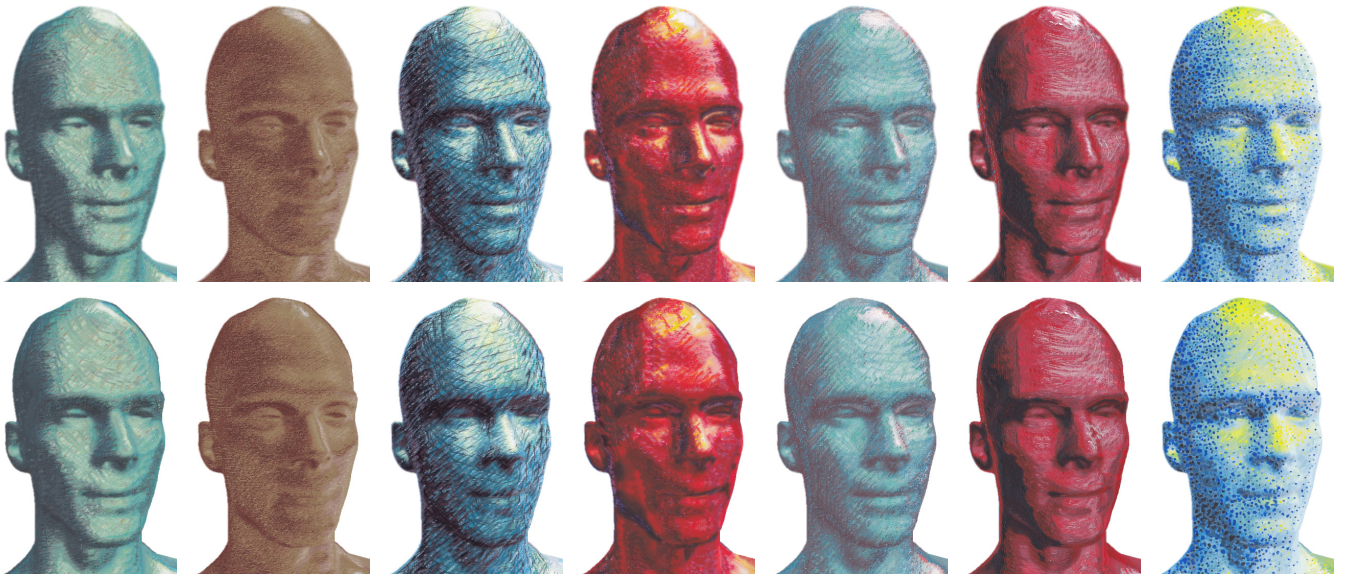
Figure 5: *Comparison with StyLit [FJL*16] (normal-based guidance): our approach (first row), StyLit (second row).*
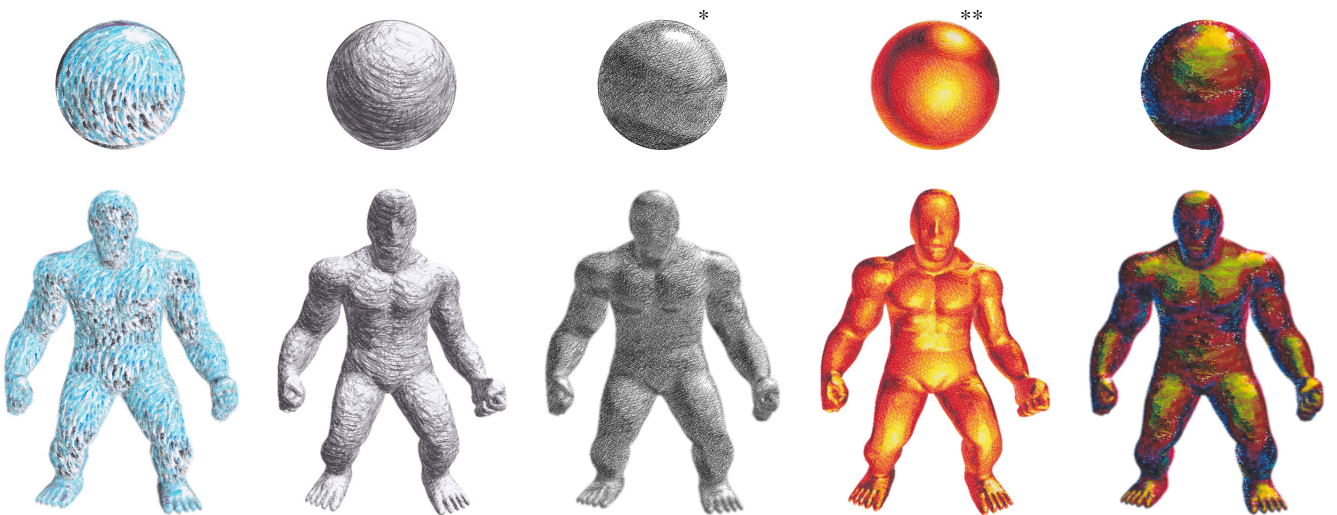

Figure 6: *Additional results with normal-based guidance demonstrating diversity of style exemplars that can be used in our method: style exemplars (top row), result of our method (bottom row). Style exemplars:* © Pavla Sýkorová, Daichi Ito*, and Zuzana Studená**
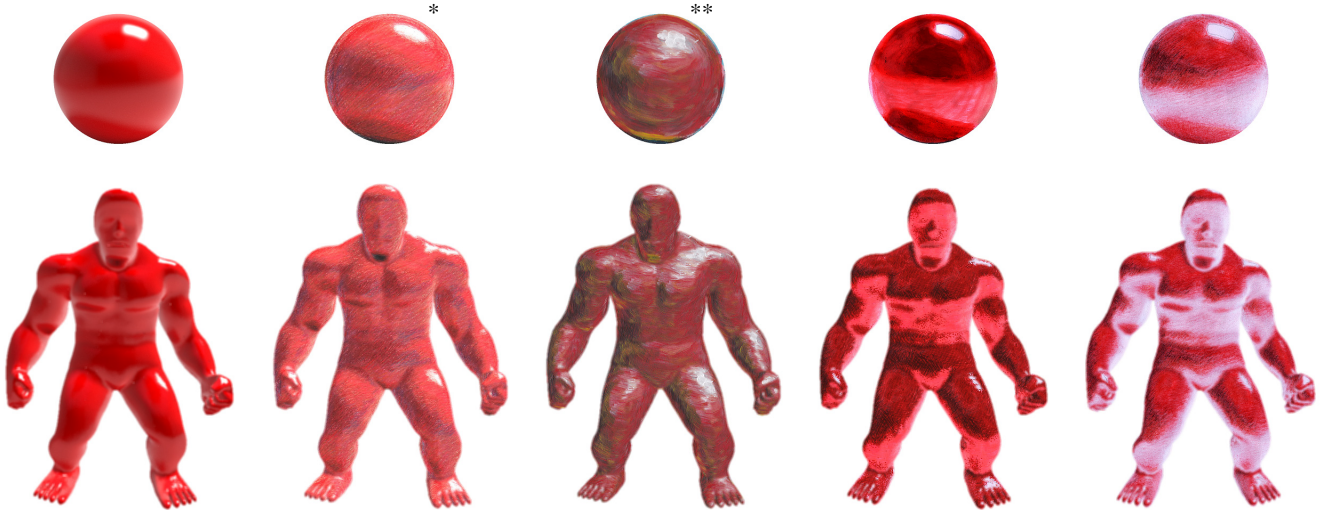
Figure 7: *Additional results for an application where normal values are used as a local guide: source style exemplars (spheres), stylized targets (golems). Style exemplars:* © Karel Seidl, Daichi Ito*, and Pavla Sýkorová**
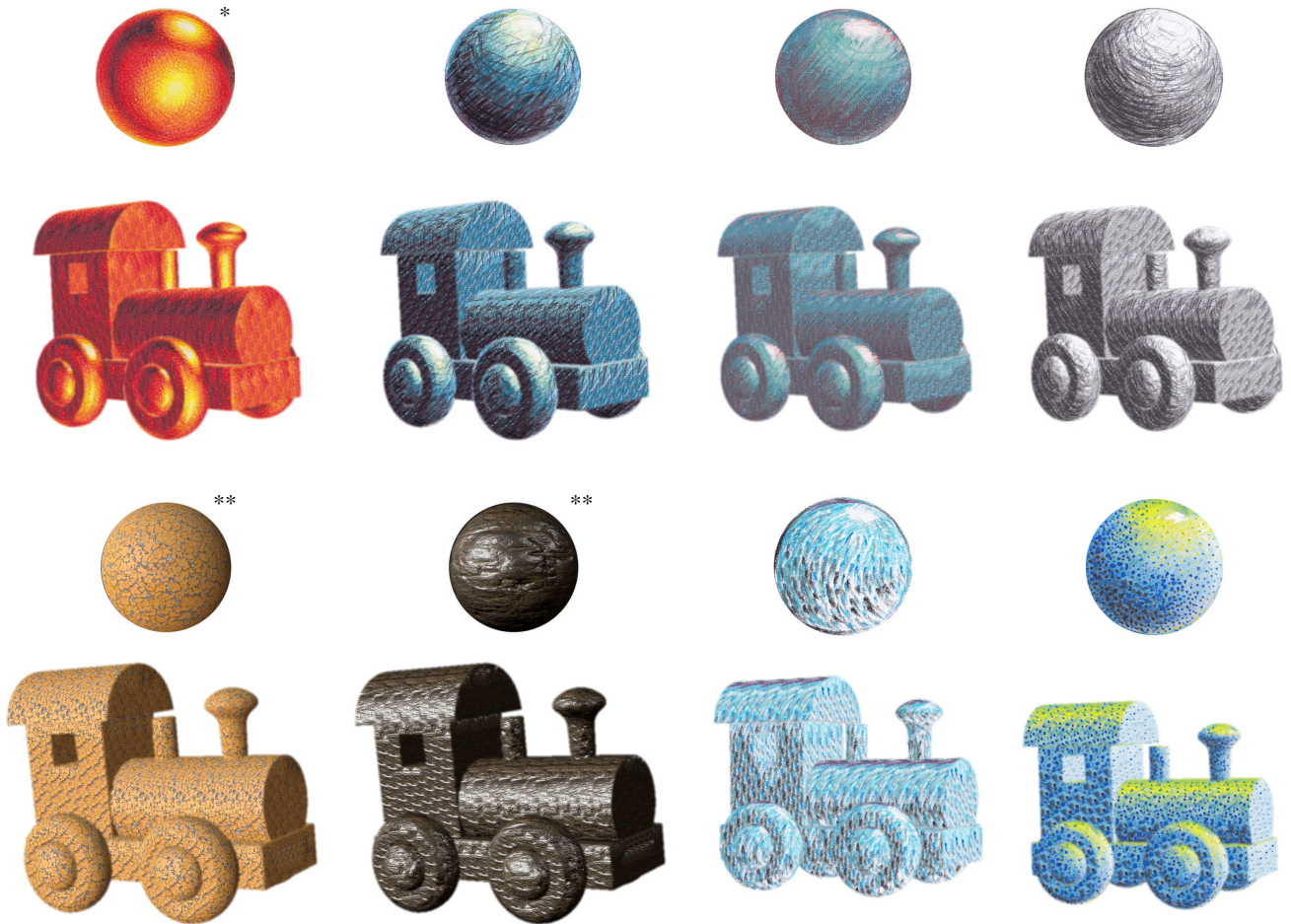

Figure 8: *Our approach applied on a CAD model (normal-based guidance): source style exemplars (spheres), stylized targets (trains). Style exemplars:* © Pavla Sýkorová, Zuzana Studená*, and Free PBR**
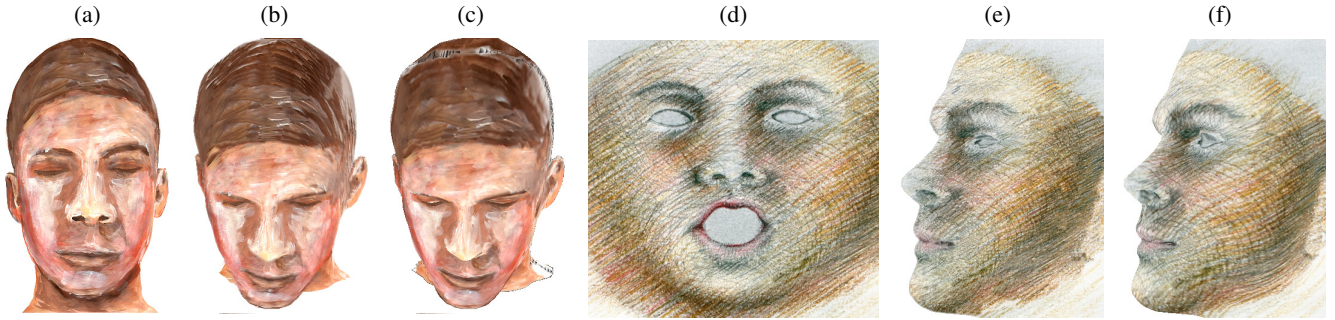
Figure 9: *Comparison with texture mapping: style exemplar drawn on a 2D projection of a 3D model (a) and on a planar unwrap of this model (d), new viewpoint generated using our approach (b, e) and using texture mapping (c, f). Style exemplars:* © *Pavla Sýkorová*

Algorithm 1: StyleBlit

Inputs : source style exemplar C_S, source guides G_S, target guides G_T, threshold t.
Output: target stylized image C_T.

StyleBlit():
  for *each pixel $p \in C_T$* **do**
    if $C_T[p]$ *is empty* **then**
      $\mathbf{u}^\star = argmin_\mathbf{u} ||G_T[p] - G_S[\mathbf{u}]||$
      for *each pixel $q \in C_S$* **do**
        if $C_T[p + (q - \mathbf{u}^\star)]$ *is empty* **then**
          $e = ||G_T[p + (\mathbf{q} - \mathbf{u}^\star)] - G_S[\mathbf{q}]||$
          if $e < t$ **then**
            $C_T[\mathbf{p} + (\mathbf{q} - \mathbf{u}^\star)] = C_S[\mathbf{q}]$
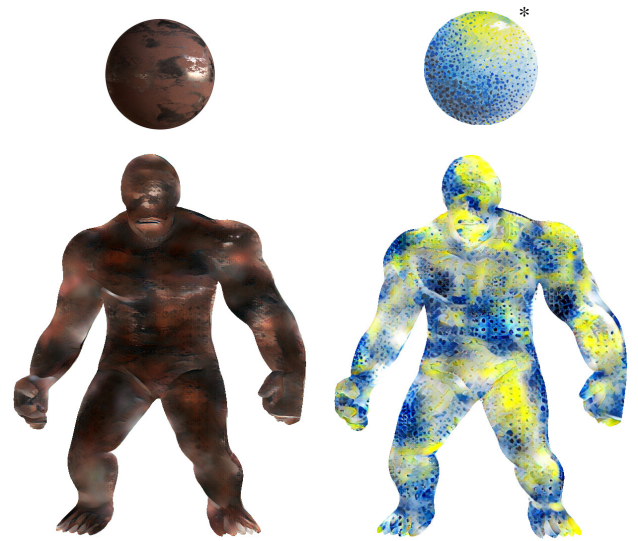

Figure 13: *Reference result of neural-based style transfer [LFY*17]: source style exemplars (spheres), stylized targets (golems). Style exemplars:* © *Free PBR and Pavla Sýkorová**

2. Perceptual Study

To verify the fact that our method produces results comparable to the output of StyLit algorithm [FJL*16] we conducted a perceptual study where we asked 13 participants 6 men and 7 women between in ages between 21 and 47. From this group 6 people had previous hands-on experience with art and computer graphics while the other 7 were uninformed observers. We showed the participants result produced by our approach side-by-side with the result of StyLit algorithm for different style exemplars presented in Fig. 1 and asked them which of the two presented renders better reproduces the original artistic style. During the experiment participants were asked to consider only the quality of artistic style, preservation of geometric details were stated as unimportant. The null hypothesis was that "there is no significant statistical difference between our approach and StyLit with respect to perceived style transfer quality". The value of χ^2-test was equal to 0.694 which clearly confirmed this null hypothesis.

References

[FJL*16] FIŠER J., JAMRIŠKA O., LUKÁČ M., SHECHTMAN E., ASENTE P., LU J., SÝKORA D.: StyLit: Illumination-guided example-based stylization of 3D renderings. *ACM Transactions on Graphics 35*, 4 (2016), 92. 1, 2, 3, 5

[FJS*17] FIŠER J., JAMRIŠKA O., SIMONS D., SHECHTMAN E., LU J., ASENTE P., LUKÁČ M., SÝKORA D.: Example-based synthesis of stylized facial animations. *ACM Transactions on Graphics 36*, 4 (2017), 155. 1, 6, 7

[LFY*17] LI Y., FANG C., YANG J., WANG Z., LU X., YANG M.-H.: Universal style transfer via feature transforms. In *NIPS* (2017), pp. 385–395. 5

[SMGG01] SLOAN P.-P. J., MARTIN W., GOOCH A., GOOCH B.: The Lit Sphere: A model for capturing NPR shading from art. In *Proceedings of Graphics Interface* (2001), pp. 143–150. 1

(a) (b) (c) (d)

Figure 10: *Comparison with FaceStyle [FJS*17]: style exemplar (a), result of our method with strong (b) and weak (c) apperance guide, result of FaceStyle (d). Style exemplars (top to bottom):* © Léonard Simard, *Adrian Morgan,* and Thomas Shahan
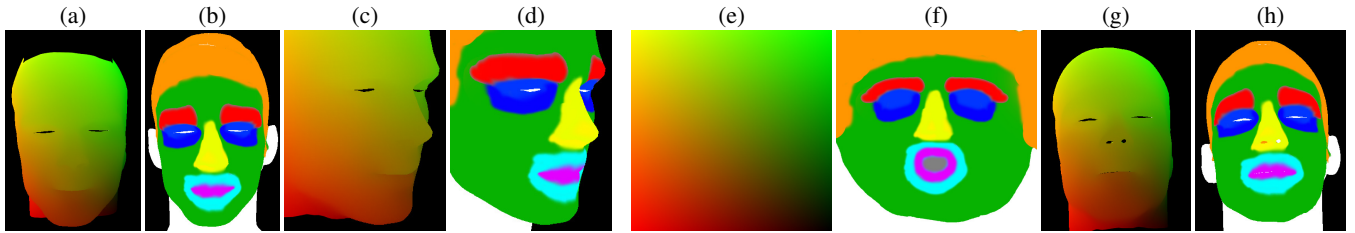
Figure 11: *Examples of guiding channels for an application where texture coordinates are used as a local guide. Scenario where a 2D projection of a 3D model is used as an exemplar: texture coordiantes guide for source (a) and target (c), segmentation guide for source (b) and target (d). Scenario where a planar unwrap of a 3D model is used as an exemplar: texture coordiantes guide for source (e) and target (g), segmentation guide for source (f) and target (h).*
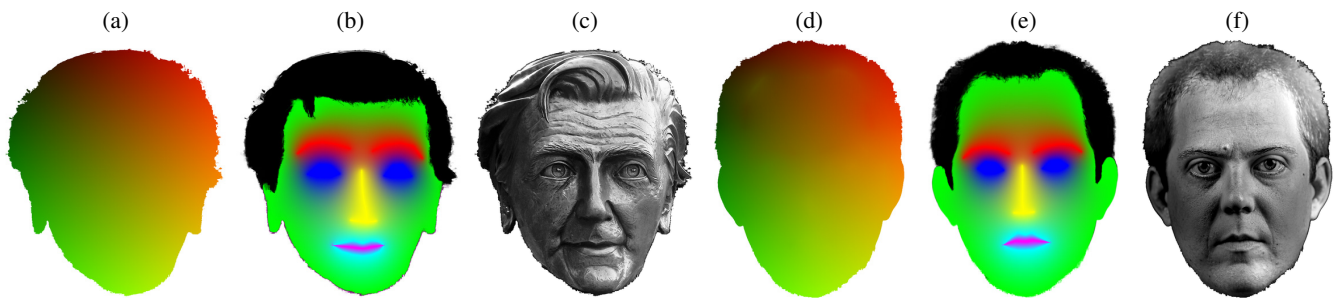

Figure 12: *Example of guiding channels for an application where displacement field is used as a local guide (FaceStyle [FJS*17]): displacement field guide for source (a) and target (d), segmentation guide for source (b) and target (e), apperance guide for source (c) and target (f).*