Artistically Stylizing the Face using Example-Based Synthesis

Team:
Yukang Shen (yukangs2)
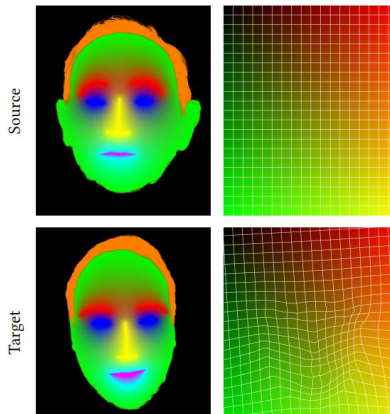Yujin Zhang (yujinz2)

Project description and goals:

Project Goal [1]

The project idea is inspired by the paper Example-Based Synthesis of Stylized Facial Animations[1], and we would like to downscale the problem and simplify the implementation (resulting in less attractive results). Basically, we are going to stylize the photo of human faces using portrait paintings. We will use an approach without deep learning that is described as follows:

1. For both the portrait painting (source) and the image to be stylized (target), detect facial keypoints using using Haar Cascades with OpenCV and/or Clandmark[2].
2. Calculate the transform of source that make the mask patches to be transferred to similar relative positions in the target image (see figure below) using the approach described in sec. 3.3 of [1], or [5].
3. Calculate weight for blending the source onto target in different areas, for example, eyes should weight more on source.
4. Alpha-blend the transformed and weighted mask onto the target.
5. Deal with the background (if time is not permitted, choose photos with blank background as targets) and do other processings to make the result looks better (smoothing, blurring, and etc.).

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[1] http://dcgi.fel.cvut.cz/home/sykorad/Fiser17-SIG.pdf
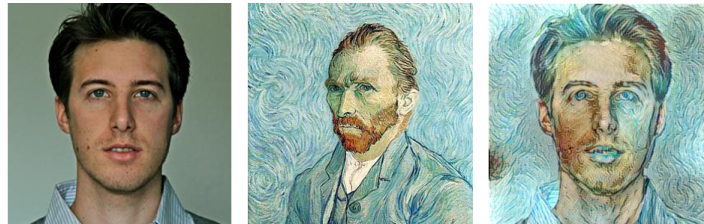[2] http://cmp.felk.cvut.cz/~uricamic/clandmark/

Transform of the source image [1]

Maximum goal:

Producing results similar to deep learning methods.

Result of [deep learning based artistic style transfer by Gatys et al](#) [3][3]

Minimum goal:

1. If we fail to implement step 2 in the approach above, calculate some simpler transform like homography.
2. If time is not permitted, skip dealing with the background in step 4.
3. If the outcome is not attractive enough, omit step 3.

Member roles:

Yukang will focus on part with detecting facial keypoints (step 1 in the approach described above). Yujin will work on the part calculating the transform of source image (step 2). We will collaborate on the rest parts of the project.

Interacting methods: Github issues, online messaging, and offline meetings.

Resources:

The dataset we will be using consists fixed art style references. Example shows below. The face image dataset is pulled from ImageNet with Synset tagged with "face". [4] We have a total of 1570 images, but may only use a small subset of them. We will implement our project with Python, we will use OpenCV library.

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[3] https://arxiv.org/abs/1508.06576

Art Style Image
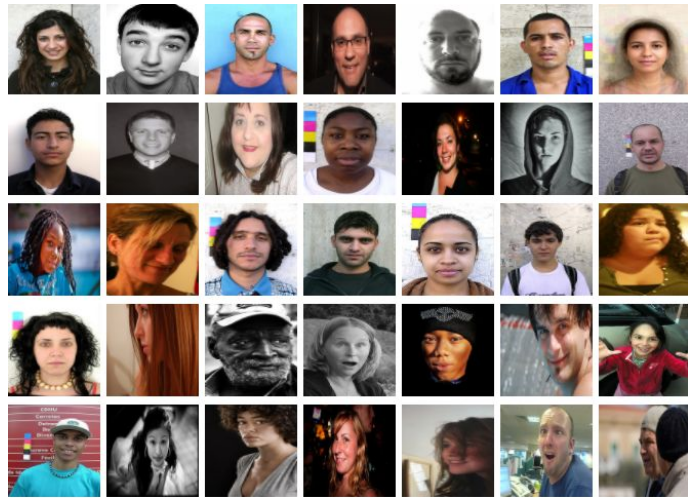
Face Images

Reservations:
1. Detecting facial keypoints.
2. Calculating the transform of source image to match the relative positions of the target image.

Relationship to your background:

Yujin Zhang:

No previous experience with machine learning and image processing.
Knew python but never used OpenCV and didn't use python for previous MPs.

Yukang Shen:

Took Artificial Intelligence course.
Used Python and OpenCV to implement MPs for this course.
No extracurricular experiences.

Reference:

[1] Jakub Fiser, Ondrej Jamriska, David Simons, Eli Shechtman, Jingwan Lu, Paul Asente, Michal Lukac and Daniel Sykora. "Example-Based Synthesis of Stylized Facial Animations". *ACM Transactions on Graphics 36(4):155, 2017 (SIGGRAPH 2017).* July 2017.

[2] http://cmp.felk.cvut.cz/~uricamic/clandmark/

[3] https://github.com/baumgach/artistic-style-transfer

[4] http://www.image-net.org/synset?wnid=n09618957

[5] Thaddeus Beier and Shawn Neely. "Feature-based image metamorphosis". *ACM SIGGRAPH Computer Graphics*. Volume 26 Issue 2, July 1992.