

Digital Image Processing

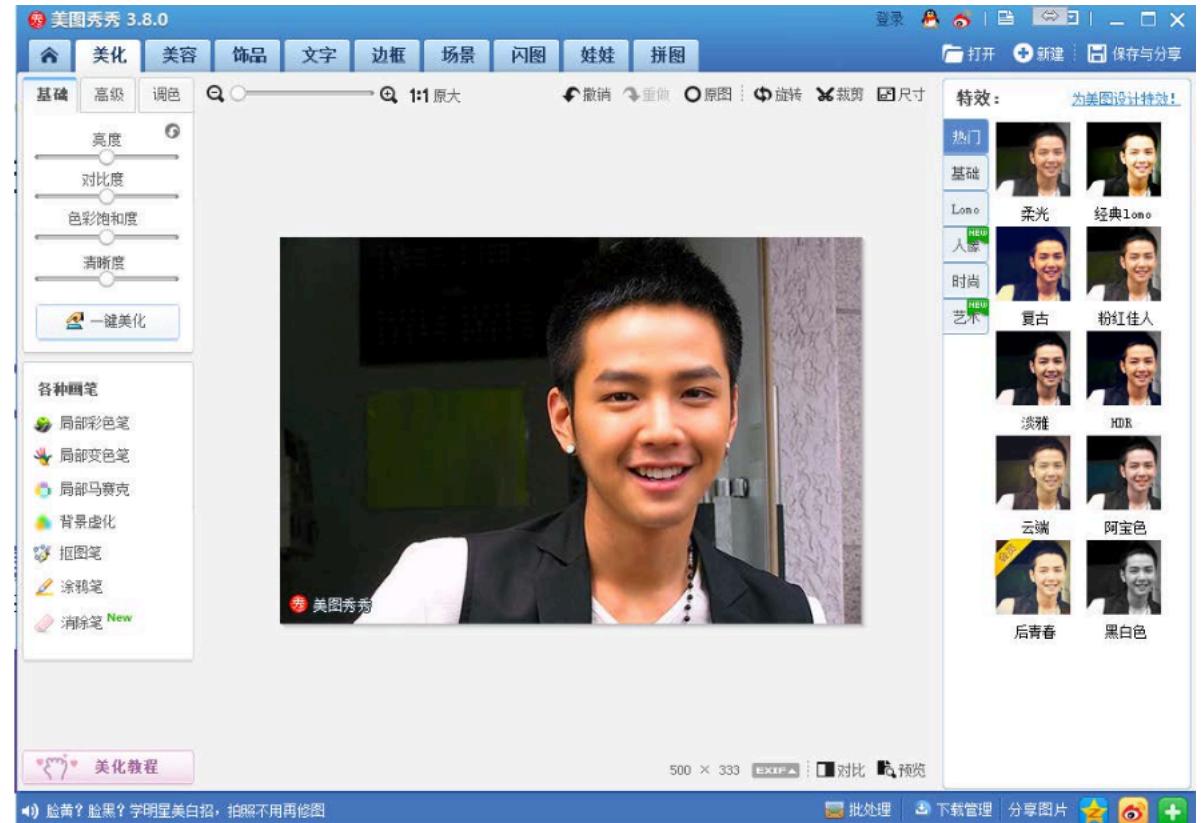
Experiment 1

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Basic part: Point processing

- Brightness
- Contrast
- Gamma
- Histogram Equalization
- Histogram Matching
- And more...(Saturation etc.)



Advanced Part1 : Image fusion



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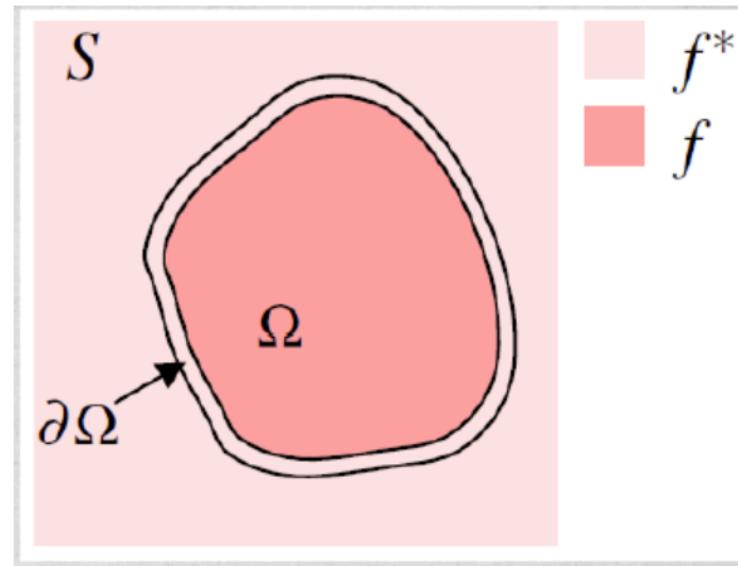


Method: Poisson Image Editing.

- Pérez, P., Gangnet, M., & Blake, A. (2003). Poisson Image Editing. ACM SIGGRAPH 2003.
- 心理学家发现,人类的视觉对局部对比度变化的敏感度远高于对整体亮度变化的敏感度。
- 利用这一点, 我们可以做这样的操作: 使两幅图像在融合边界处完全一致, 但却在保持融合区域内部的梯度的同时, 整体地调整亮度/颜色。

Method: Poisson Image Editing.

- 设 Ω 是从A图中拷贝出来的一部分， $\partial\Omega$ 是其边界。S区域属于B图。
- 设 Ω 区域原来在A图中的颜色为 g ，融合后的新颜色为 f 。S区域的颜色为 f^* 。
- 我们可以对R、G、B三通道分别做操作，所以在这里把颜色看做一个单值函数。

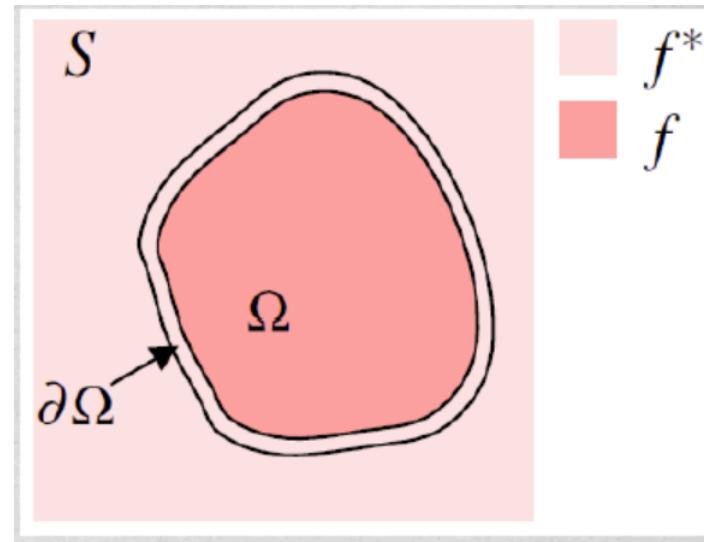


Method: Poisson Image Editing.

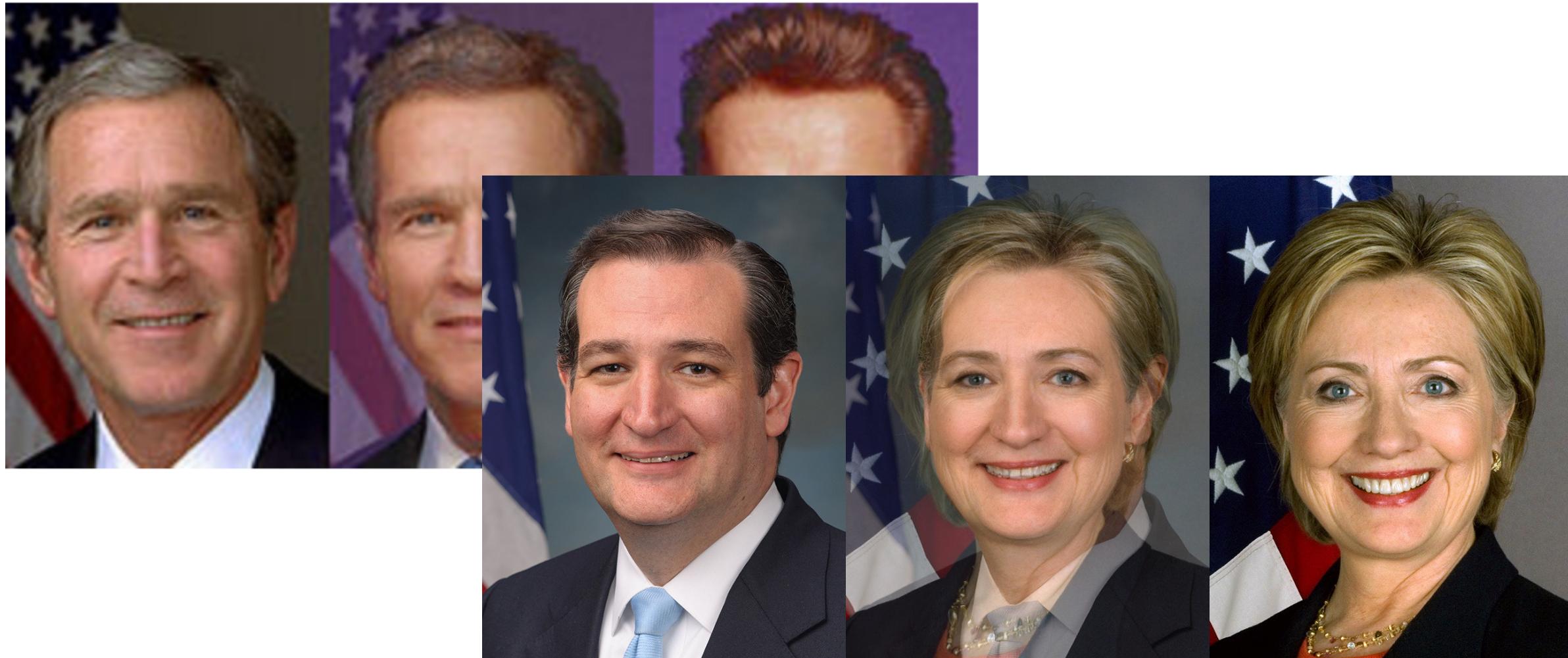
- 为了从视觉上消除边界，可以固定 $\partial\Omega$ 上的颜色等于B图中的颜色，而 Ω 内部的颜色梯度保持与A图一致。
- 目标是解出融合后的新颜色函数 f ，使：

$$\min_f \iint_{\Omega} |\nabla f - \nabla g|^2, f|_{\partial\Omega} = f^*|_{\partial\Omega}$$

其中 $\nabla \cdot = [\frac{\partial \cdot}{\partial x}, \frac{\partial \cdot}{\partial y}]$ ，是一个梯度算符



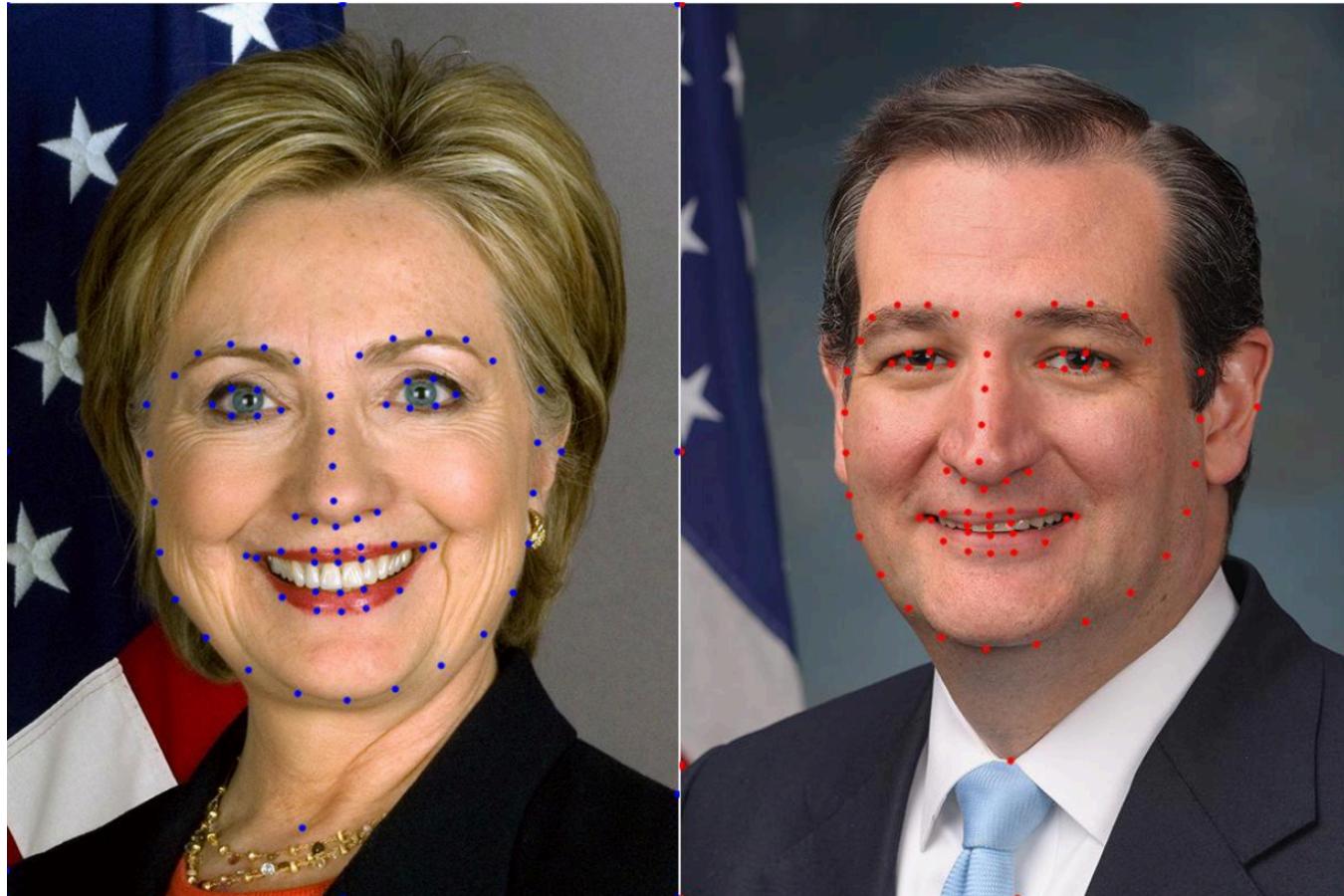
Advanced Part1 : Face Morphing



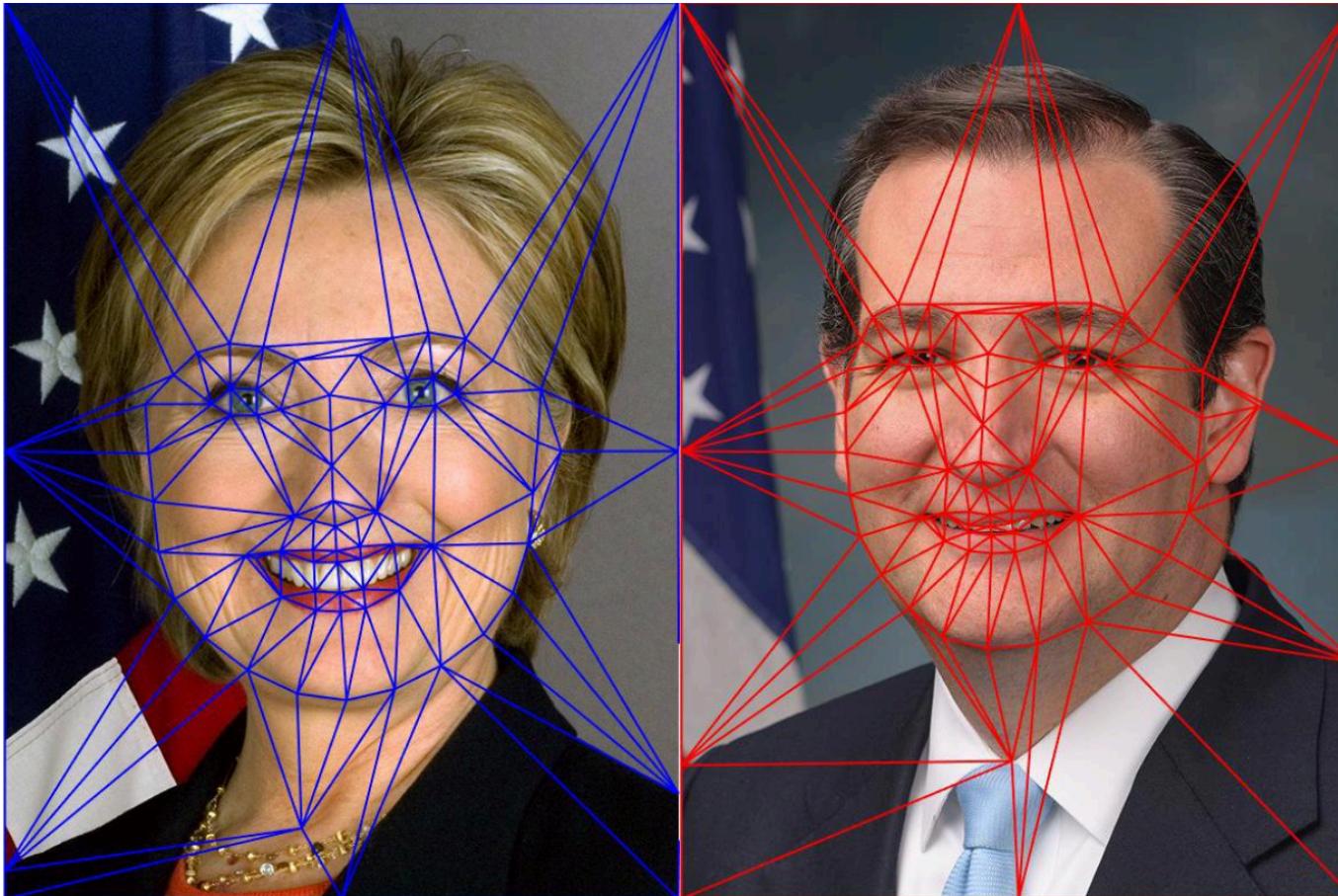
Naïve Method



Facial Feature Detection



Triangulation



Warping and Blending



Experimental requirements

Language:

- C++, Matlab, Python etc.
- You can use image I/O function.
- Other image functions in matlab, python, openCV, openGL and other image processing lib are forbidden **except for facial feature detection**

Experimental requirements

1.Files you need to submit:

 Your Code

 Report

2.Evaluation:

 Basic part: 40%

 Advanced part1: 30%

 Advanced part2: 30%

 Others: 5~10%

- Reserve the right of final interpretation
- Questions are welcome