Face Photo-Sketch Synthesis Based on Conditional Adversarial Networks

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二. 成果简介：

In this paper, we proposed conditional generation adversarial networks (CGAN) based on arts drawing steps constrain. We divide the process into two stages. To add realism, we train our network using an adversarial loss. Experiments have shown that, Compared with previous methods, our results generate visually comfortable face sketches. And express more natural textures and details.

二. 主要研究内容及创新点：

The innovations of this paper are as follows: (1) firstly, a database containing 400 face sketches is proposed, which we call Ord-Sketch (sketch library with sketch order, order-Sketch),(2) Ord-Sketch is a database with temporal characteristics, based on which a novel generating conditional confrontation network model SO-Net (Self-Organizing) is proposed. The Network). SO-Net model divides the sketch generation process into two stage. Each stage generator contains the same structure of convolution neural network (Convolutional Neural Network,CNN) encoder and decoder(Fig 1). To optimize our networks, alternate between one gradient descent step on D, then one step on G. follow(Fig 2). In the experiments, we perform face photo-sketch synthesis on the CUFS datasets and compared with existing advanced methods:MWF, MRF and cGAN . And we attempt to recover the image directly from attributes without going to the intermediate stage of sketch. The entire network in (Fig 3)is trained stage-by-stage using caffe.

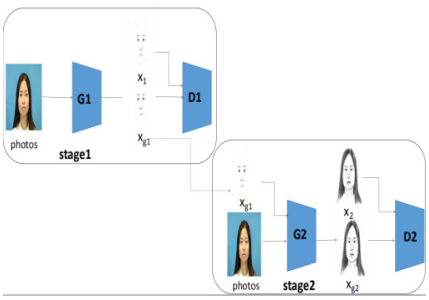


Fig 1 Two-stage trainging networks

Alogrithm 1: Optimization procedure of our network

Input: Set of synthetic images x_{g1} ,x_{g2} ,and real images x_1,x_2,a face photo y,max number of steps(T);

Outoput: optimal G1,D1,G2,D2;

initial G1,D1,G2,D2;

for t=1,. . .,T **do**

1. select one training instance:
{Set of synthetic images x_{g1} ,x_{g2} ,and real images x_1,x_2,a face photos y}
2. Estimate the first stage sketch imag:
x_{g1} =G1(y)
3. Estimate the first stage sketch imag:
x_{g2} =G2(x_{g1} ,y)
4. Update D1:
D1=argmin$_{D1}L_A$(G1,D1)
5. Update D2:
D2=argmin$_{D2}L_A$(G2,D2)
6. Update G1:
G1=argmax$_{G1}L_A$(G1,D1)+λL_1(x_1,x_{g1})
7. Update G2:
G2=argmax$_{G2}L_A$(G2,D2)+λL_1(x_2,x_{g2})

end

Fig 2 optimization

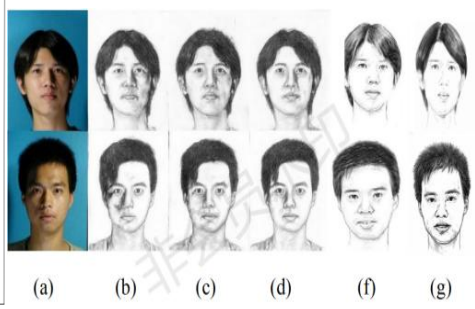


Fig 3 Comparison of the sketch synthesis result using three different approach and our model: (a) photos;(b) sketches by artist from CUFS; (c) MWF; (d) MRF; (e) cGAN; (f) our model; (g) sketches by our artist

四. 主要研究成果及应用情况

在 2019 第十六届中国信息系统及应用大会（WIAS 2019）上发表 EI 论文一篇

在 2019 计算机辅助设计与图形学学报发表论文一篇

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