Diversified Texture Synthesis with Feed-forward Networks

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Contributions

A deep generative feed-forward network for diverse multi-texture synthesis and multi-style transfer

- Encourage diversity in outputs as the generator should be powerful enough to generate diverse results for one texture example
- Enable multi-texture synthesis in one single network to reduce the heavy burden of existing feed-forward methods which requires one network for one given texture

Diversity loss

\[ L_{\text{diversity}} = \frac{1}{N} \sum_{i=1}^{N} \| \Phi(P_i) - \Phi(Q_i) \|_1 \]

- P: Outputs in a batch
- Q: Reordering of outputs (Pi=Qi)
- \( \Phi \): Enlarge feature distance

Multi-texture synthesis in one network

- For a given texture set, each bit in the selection unit represents one texture example
- Inject selection at every upsampling scale to help the model distinguish different textures

Incremental training

- Outputs in a batch
- Reordering of outputs (Pi≠Qi)
- Enlarge feature distance

Texture interpolation

- From one to many to arbitrary

Loss Network

Generator

Texture

Selection unit

Noise

Texture loss

Generator Network

Texture

Output

Loss Network

Texture loss

Texture 1

Texture 2

Ours

Gatys et al., CVPR16

Multi-style transfer in one network

- Style 1
- Style 2
- Style 3
- Style 4
- Style 5
- Style 6

Outlook: from one to many to arbitrary

- Learning-based: adaptive normalization layer
  [Huang et al., arXiv:1703.06868]  [Ghiasi et al., arXiv:1705.06830]
- Non-learning-based: image reconstruction + feature transform
  [Li et al., arXiv:1705.08086]