Style transfer by relaxed Optimal transport and Self-Similarity

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1 Summary

1.1 Problem

The paper presents a novel way of *style transfer* through optimization based techniques. In current scenarios, user specification is missing when transferring the style. Thus user specific visual effects seem to be missing.

The scientific community is missing the formal definitions of *content* and *style* which are hard to define semantically and mathematically.

1.2 Innovation

The paper presents an optimization based style transfer algorithm - **Style Transfer by Relaxed Optimal transport and Self-Similarity**. The authors define style and content in the deep learning scenario.

1.3 Contributions

Style has been defined as the distribution over features extracted by a DNN. The idea of **Content** has been adopted from the concept of self-similarity and the notion that human's perceptual system is robust to identify objects based on their relative environment rather than absolute positions.

- Features are extracted through VGG - 16 Net and are merged through hypercolumns.
- All the features are considered to be of equal mass and the style loss is defined as the **Earth Movers Distance**
- For defining the content loss the normalised cosine distance between feature vectors was kept constant between the content and the output image.
- User control is added by defining two spatial regions $X^{(t)}$ and I_S which have low style loss.

1.4 Evaluation

Experimetns are divided into three categories -

- Paired - when the content image and style image are both representations of the same category
- Unpaired - when the content and style are not of the same category
- Texture - When the content is a photograph of a face and style is a homogeneous texture.

1.5 Substantiation

The paper proposes a novel idea of style transfer and also gives user control over the region to transfer. The authors provide detailed study of different types of losses and their contribution to style transfer. The authors also show significant improvement in timings.