Introduction

Style transfer is the process of generating an image that combines the style of an input image and the content from a different one.

Application domains:
- Gaming industry:
- Mobile application development
- Architecture

Goal: Transform images based on the features of specific paintings using style transfer

Challenge:
- style transfer is not based on a single image.
- Extraction of common features that characterize the whole collection of images and not the style of a single image.

Aims and Objectives

- Preserve the content and style characteristics.
- Involve BEMD to preserve the more informative parts of the content image and style elements.
- Quantify the deformations between the original content image and the generated one, and in parallel to preserve the style from a collection of style images.

FABEMD - Background

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CycleGAN - Background

- Cycle-Consistent Adversarial Networks learn mapping functions between two domains $X$ and $Y$
- Adversarial Loss minimisation for matching the distribution of generated images to the data distribution in the target domain (style)
- Cycle Consistency Loss minimisation to prevent the learned mappings $G$ and $F$ from contradicting each other

Proposed Framework

- Two generators $F$ and $G$ and two discriminators $D_X$ and $D_Y$
- $G$ takes an image of a landscape and generates painting images of the given style.
- $F$ generates photos of landscapes, given photos of paintings.
- Cycle Consistency loss is computed between sets of BIMFs instead of the corresponding original images

Experimental Results

- Table comparison of methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Time (s)</th>
<th>Dec. Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[21]</td>
<td>0.7</td>
<td>0.49</td>
</tr>
<tr>
<td>[13]</td>
<td>0.7</td>
<td>0.77</td>
</tr>
<tr>
<td>Ours</td>
<td>0.7</td>
<td>0.51</td>
</tr>
</tbody>
</table>

- Zhu et al., 2018
- Sankaray et al., 2016
- CycleGAN - BIMF3- CS

- Visual comparison of methods

- Cycle-Consistent Adversarial Networks and Fast Adaptive Bi-dimensional Empirical Mode Decomposition for Style Transfer

Conclusion

- The new formulation of the cycle consistency loss is introduced by estimating the loss through the BIMFs from the decomposition of content-to-content and style-to-style images.
- The experiments reveal that the proposed method produces better qualitative and quantitative results than the State-of-the-art.
- Saliency maps and deception rates proved the effectiveness of the presented method compared to other similar approaches.
- Distances between saliency maps as a new evaluation measure in style transfer.

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