DR2S: Deep Regression with Region Selection for Camera Quality Evaluation

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Texture/Details preservation

-> Ability to render fine details
## Texture measurements

<table>
<thead>
<tr>
<th></th>
<th>State of the art</th>
<th>Ours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chart</td>
<td><img src="chart.png" alt="MTF-based Chart" /></td>
<td><img src="chart2.png" alt="Learning-based Chart" /></td>
</tr>
<tr>
<td>Method</td>
<td>MTF-based</td>
<td>Learning-based</td>
</tr>
<tr>
<td>Measure</td>
<td>Acutance</td>
<td>Perceptual quality</td>
</tr>
</tbody>
</table>
Discriminant Regions problem

<table>
<thead>
<tr>
<th>Low quality</th>
<th>High quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Low quality" /></td>
<td><img src="image2" alt="High quality" /></td>
</tr>
<tr>
<td><img src="image3" alt="Low quality" /></td>
<td><img src="image4" alt="High quality" /></td>
</tr>
</tbody>
</table>

Which regions of the chart are the most useful for details preservation evaluation?
Method

Training set

$X_1$  $X_N$

$Y_1 = 0.92$  $Y_N = 0.18$
Method

1. Initial Training

Train set

\[ X_1 \quad \ldots \quad X_N \]

\[ Y_1 = 0.92 \quad \ldots \quad Y_N = 0.18 \]
Method
Method

1. Initial Training

2. Region Selection

3. Final Training

Random Patches

Training set

\[ Y_1 = 0.92 \quad \ldots \quad Y_N = 0.18 \]

Selected Patches

ConvNet

\[ \mathcal{L} \]

ConvNet

Confidence map: \( M \)

Selected region

DXOMARK

INSTITUT

POLYTECHNIQUE

DE PARIS
Results

Spearman Rank-Order Correlation Coefficient

<table>
<thead>
<tr>
<th></th>
<th>Dead Leave Chart</th>
<th>Still-Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTF-Based</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Naive Learning</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Random Region</td>
<td>0.7</td>
<td>0.9</td>
</tr>
<tr>
<td>Selected Region</td>
<td>0.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>
Thank you!

Any question?
Traditional texture measures

Traditional method to automatically evaluate camera quality: Photograph fixed content in controlled lighting conditions

Computation method: Modulation transfer function (Relation between content photographed and resulting image) and Acutance (Sharpness measure derived from the MTF)

Issues:
- Too simplistic,
- Highly unnatural details,
- Does not explicitly measure perception.

More natural looking charts are used for perceptual evaluation