Supplementary Material

Mop Moiré Patterns using MopNet

Bin He¹ Ce Wang¹ Boxin Shi¹,² Ling-Yu Duan¹,²*

National Engineering Lab for Video Technology, Peking University, Beijing, China¹

The Peng Cheng Laboratory, Shenzhen, China²
Network Structure

Input $F_0$ to $E_s$ is fed into the Channel-wise Target Edge Predictor $g_e$ to predict edges $g_e$. The predicted edges are combined with non-local block $NB$ and nonlinear upsampling $NU$ to form intermediate feature map $F_m$. Multi-scale aggregation further processes $F_m$ to output $g_r$. The inner module data flow includes feature concatenate and upsampling.

NB: Non-local Block
NU: Nonlinear Upsampling
SE: Squeeze & Excitation
CW: Channel-Wise

The network structure includes layers such as convolution, pooling, and upsampling. The diagram shows the flow of data through the network, highlighting the integration of feature maps and the application of various operations to enhance edge detection and prediction.

Legend:
- Conv Layer (stride = 1)
- Squeeze & Excitation Block
- Bottleneck Block
We hire professional data annotators, and show them the typical sample images of moiré pattern with one type of dominant attribute to explain the attribute classification task. For example, in the leftmost group of Figure S1, the image in the middle and the image on the right exhibit the representative case where the moiré pattern in image belongs to curve class and straight stripe class concerning pattern shape, respectively.

Then the sample criteria images, which are displayed in the left in each group of Figure S1, are given to annotators for reference. Specifically, take the frequency criteria image in the second group for instance, we ask the annotators to label the moiré pattern in the image as a high frequency one if its dominant frequency appears higher than the criteria image, and vice versa.

The annotators are divided into three groups to deal with the three attributes respectively. Given an image, two annotators are asked to classify each single attribute independently in the first pass, and when their annotations are inconsistent, the third annotator is required to re-annotate the attribute.
As for the complex patterns with mixed or ambiguous appearance attributes, we choose to annotate the pattern with the most dominant attribute labels for describing the pattern appearance and facilitating the removal on the whole.

For instance, Figure S2(a) shows a mixed scene where there exist both curves and straight moiré stripes in a single image, and we label this image as curve moiré pattern because the straight stripes only occupy a rather small part on the right, while the curve pattern dominates in this image. Similarly, (b) is annotated as straight shaped class, and in terms of frequency, (c) is labeled as a low frequency moiré pattern, while (d) is a high frequency one.
We invite 50 participants to rate the quality of 50 randomly selected results of MopNet according to their visual perception, compared with other three moiré-specific methods including descreen plugin\(^1\) for Photoshop, Yang et al\(^2\), and DMCNN\(^3\).

The procedure of the perceptual study is as follows:

1. We explain the phenomenon of moiré pattern and display sample moiré contaminated images to participants to help them to understand each pattern attribute.
2. Participants are asked to rate 50 groups of images in terms of visual quality. In each group, the leftmost image is the input image randomly selected from the testing set, and the other images are moiré pattern removal results by MopNet and the other three methods, shown in random order. No time constraints are placed for rating.
3. The number of images is calculated by summing the choices of all participants, with a total number of \(50 \times 50 = 2500\) for each method.
4. The average perceptual preference score \(\phi\) is computed from the rankings, as

\[
\phi_m = \frac{1}{M} \sum_i \sum_j \left( N - \text{rank}_{i,j,m} + 1 \right),
\]

where \(m\) stands for a certain method, \(M\) for the number of participants, \(N\) for the number of methods evaluated, and \(i,j\) for the index of participant and the group of results.

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\(^1\)http://www.descreen.net/eng/soft/descreen/descreen.htm


As Figure S3 illustrates, the average perceptual preference score of MopNet is evidently higher than the other methods by a great margin, and MopNet has achieved the most rank-1 choices with very few rank-3 or rank-4 results.

The perceptual study results demonstrate that MopNet performs the best in terms of enhancing the visual quality of moiré contaminated images, and human observers show clear preference order in moiré pattern removal results by different methods as: MopNet, DMCNN, Yang et.al, and Descreen.
As shown in Figure S4, we compare the complete MopNet against variations of full objective through perceptual study. The average perceptual preference score of MopNet is higher than those of any ablations. Besides, the MopNet has the most rank-1 images compared to other variations.

It is consistent with quantitative evaluation results in our main paper that proposed modules benefit the removal of moire patterns. In some cases, any of edge map or classification suffices to remove the moire patterns. It may be because both modules infer the shape information from patterns, facilitating better removal.
We show some zoom-in results generated by MopNet.
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More Comparison Results

- High Frequency:
More Comparison Results

Low Frequency:

Input | GT | MopNet | DMCNN | Yang et al. | Descreen
More Comparison Results

- Curve:
More Comparison Results

- **Straight:**

  Input | GT | MopNet | DMCNN | Yang et al. | Descreen

  ![Dog Image](image1)
  ![Dog Image](image2)
  ![Dog Image](image3)
  ![Dog Image](image4)
  ![Dog Image](image5)
  ![Dog Image](image6)
More Comparison Results

- Single Colour:

Input | GT | MopNet | DMCNN | Yang et al. | Descreen
More Comparison Results

- Multiple Colour:

- Input
- GT
- MopNet
- DMCNN
- Yang et al.
- Descreen
More Comparison Results

- Mixed Frequency:
More Comparison Results

- Mixed Shape:

Input | GT | MopNet | DMCNN | Yang et al. | Descreen
More Ablation Results

- Zoom-in for details:

<table>
<thead>
<tr>
<th>Input</th>
<th>GT</th>
<th>MopNet</th>
<th>B</th>
<th>B+M</th>
<th>B+M+C</th>
<th>B+M+E</th>
</tr>
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More Ablation Results

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![Image](image-url)
Cross Data Evaluation

- We test MopNet with images captured ourselves:

- **Iphone 8 Plus + DELL P2414H**

- **Iphone 8 Plus + DELL U2417H**
Cross Data Evaluation

- We test MopNet with images captured ourselves:

- **Redmi Note 5A + DELL P2414H**

- **Redmi Note 5A + DELL U2417H**