OSM: An Open Set Matting Framework with OOD Detection and Few-Shot Learning

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Open Set Matting Framework (OSM)

The overview of our OSM. The out-of-distribution (OOD) detection network detects unseen samples whose appearance within unknown region of trimap is unseen during training. After annotation of a few unseen samples, we conduct few-shot adaptation.

Our contributions:
- The first open set matting (OSM) framework to tackle matting task from an open set perspective.
- Our OOD detection network achieves the new state-of-the-art performance on SIMD dataset compared to other OOD detection methods.
- We validate that our few-shot learning matting module can not only prevent catastrophic forgetting but also avoid over-fitting.

OOD Detection Network (OOD-DN)

Our OOD-DN leverages prototype learning with intra-batch connection to be unseen-aware and generate informative logit features whose maximum is regarded as negative anomalous score.

Incremental Few-Shot Learning Matting Module (IFL-MM)

After training the matting network on ID data, we extend it to OOD data with a few samples but without catastrophic forgetting by RemodelBN, lr ExpDecay, and EWC based Reg.

Experimental Results

<table>
<thead>
<tr>
<th>Methods</th>
<th>AUROC(0.1)</th>
<th>AUROC(0.5)</th>
<th>AUROC(0.9)</th>
<th>AUROC(0.95)</th>
<th>AUROC(1.0)</th>
<th>AUROC(1.05)</th>
<th>AUROC(1.1)</th>
<th>AUROC(1.15)</th>
<th>AUROC(1.2)</th>
<th>AUROC(1.25)</th>
<th>AUROC(1.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIP [16]</td>
<td>0.670</td>
<td>0.870</td>
<td>0.987</td>
<td>1.000</td>
<td>1.000</td>
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<tr>
<td>MemLog [19]</td>
<td>0.629</td>
<td>0.883</td>
<td>0.950</td>
<td>0.998</td>
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<tr>
<td>Ew-logRec [28]</td>
<td>0.682</td>
<td>0.878</td>
<td>0.955</td>
<td>0.995</td>
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<td>1-G StubsRec [30]</td>
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<tr>
<td>MIP [16]</td>
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<td>0.884</td>
<td>0.941</td>
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</table>

OOD detection results on SIMD dataset.

Visual comparison of matting results on 5 OOD classes of SIMD dataset. From the 1st row to the 5th row, glass_ice, fire, water_drop, spider_web, and water_spray. From left to right, image, trimap, GT, Pre-trained model, Finetune, IFL-MM (Ours), and OSM (Ours).

Ablation study results of our OOD detection network on SIMD dataset. PL refers to prototype learning.

Ablation study results of our IFL-MM