1. Pseudo-code of Ambiguity-Masking

The overall algorithm of the proposed Ambiguity-Masking is summarized as Alg. 1. Please refer to our Github repository for full implementation.

```
Algorithm 1 Extract Ambiguities for Photometric Loss

Input: target image \( I_t \), source images \( I_{t+n} \), indices of source images \( src_ids \), reconstructed images \( \hat{I}_{t+n} \), photometric errors of all source images \( L \)

Output: \( A_{pe}^t \): ambiguity mask of the final photometric error
1: \( A_t \leftarrow EXTRACTAMBIGUITYFORIMAGE(\hat{I}_t) \);
2: \( reproj\_ambiguities \leftarrow list \);
3: for all \( n \) in \( src_ids \) do
4: \( A_{t+n} \leftarrow EXTRACTAMBIGUITYFORIMAGE(\hat{I}_{t+n}) \);
5: \( \hat{A}_{t+n} \leftarrow \text{bilinear sample } A_{t+n} \text{ subject to } \otimes_{t+n} \); // to get which pixels in reconstructed \( \hat{I}_{t+n} \) are from the ambiguous pixels in source \( I_{t+n} \).
6: append \( \hat{A}_{t+n} \) to \( reproj\_ambiguities \);
7: end for
8: \( \text{min}_\text{idx} \leftarrow \arg \min (L) \); // we adopt \( \min \). reprojection loss from [12].
9: \( A'_t \leftarrow \text{reproj\_ambiguities}[\text{min}_\text{idx}] \); // to gather ambiguity value adopted in the final loss map.
10: \( A_{pe}^{max} \leftarrow \max(A_t, A'_t) \); // as Eq. 13.
11: \( A_{pe}^{pe} \leftarrow A_{pe}^{max} < \delta \); // as Eq. 14.
12: return \( A_{pe}^{pe} \);

procedure EXTRACTAMBIGUITYFORIMAGE(\( I \))
13: \( F \leftarrow \text{compute frequency map of } I \); // as Eq. 9.
14: \( \mu \leftarrow \nabla u^+ \cdot \nabla u^- < 0 \left\| \nabla u^+ \cdot \nabla u^- < 0 \right\| \); // as Eq. 10.
15: \( A \leftarrow \mu F \);
16: return \( A \);
```

2. Further Consideration on the Two Modules

We let the Ambiguity-Masking module take input from the Auto-Blur because we want the high-freq regions of input images to be first processed by Auto-Blur before extracting ambiguities. The reason for this lies in the fact that without smoothing the high-frequency areas, the Ambiguity-Masking would wrongly filter out almost all pixels in high-frequency areas as the dense thin objects inside are likely to be misjudged as ambiguous colors, disabling them from participate in training.

3. Full Numbers of Hyper-params Ablation

In this section, we show full numbers of ablations of all hyper-parameters in our methods, as reported in Tab. 1. We then give detailed analyses on each one of them.

If \( \delta \) is too small, the Amb.-masking will wrongly exclude some non-ambiguous pixels, e.g., the long wall from near to far could also satisfy the constraint of gradual color transition, but it does not belong to the problem demonstrated in Fig. 1. If \( \delta \) is too large, boundaries with little color difference will be missed.

For kernel size \( s \) in Auto-Blur, if we decrease \( s \), the receptive field could not be effectively enlarged when measuring pixel similarity. If we increase \( s \) too much, the central pixel’s contribution (its own characteristic color) is reduced since the Gaussian distribution gets ‘shorter’ and ‘wider’.

For threshold \( \lambda \), decreasing \( \lambda \) would wrongly smooth the texture-less regions, as the already-weak supervision signal on them will be further weakened. Increasing \( \lambda \) too much would miss some pixels in high-freq regions which could confuse the photometric loss as illustrated in Fig. 2.

For the percentage threshold \( \eta \) of high-frequency pixels in Auto-Blur, when \( \eta \) is too small, not only the texture-less regions but also some object boundary areas which do not belong to ‘high-frequency area’ would be wrongly smoothed. When \( \eta \) is too large, the same as \( \lambda \), our Auto-
### Table 1. Ablations on all hyper-parameters.

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<tr>
<th>Hyper-parameter</th>
<th>Value</th>
<th>Abs Rel</th>
<th>Sq Rel</th>
<th>RMSE</th>
<th>RMSE log</th>
<th>δ&lt;1.25</th>
<th>δ&lt;1.25²</th>
<th>δ&lt;1.25³</th>
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</table>

Figure 1. High-resolution qualitative comparisons of Monodepth2 [12] with and w/o our proposed methods (input from CityScapes [3]).

Blur would be too strict, i.e. miss to smooth some pixels in high-frequency areas which could confuse the photometric loss.

### 4. Full-Resolution Qualitative Results

We show more full-resolution qualitative depth predictions in Fig. 1 (CityScapes) and Fig. 2 (KITTI).
Figure 2. High-resolution qualitative comparisons of Depth-Hints [32] and Monodepth2 [12] with and w/o our proposed methods (input from KITTI [10]).