Depth Super-resolution with Deep Edge-inference Network and Edge-guided Depth Filling

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Introduction

The accuracy of depth acquisition are affected due to the complexity of real scenes and the imaging limitation of depth sensors. Usually, the basic idea to recover a HR depth map is to use the corresponding color image captured from the same scene.

1. We first learn a binary edge map from low resolution depth map and corresponding color image.
2. Then, a fast edge-guided depth filling strategy is proposed to interpolate the missing depth constrained by the acquired edges to prevent predicting across the depth boundaries.

Proposed Method

- The color branch acts as a feature extractor to determine informative edge features from color image.
- Depth values are directly copied from the LR depth map interpolated by bicubic in Smooth region.
- The upsampled feature maps from depth branch are concatenated with the feature maps extracted from color branch in the same resolution.
- Depth SR is estimated via an joint bilateral filter (Eq.1) in Edge Region.

\[
D_x = \frac{1}{K} \sum_{y \in N(x)} G_{\sigma}(I_y - I_x) \cdot 1(x; y, E)D_y, \quad (1)
\]

Experimental Results

This paper proposes a novel depth super-resolution framework with (1) deep edge-inference network and (2) edge-guided depth filling. Experimental results show that our method outperforms the state-of-art methods in both the edges inference and depth super-resolution, and generalizes well for handling diverse depth datasets.

Conclusion

Generalization