Adaptive DBE Loss for Depth Prediction :- Implementation Details

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GitHub Repository for the Project

1 Method

The DBE Loss function in the previous paper enabled balanced depth prediction by applying a transformation that scales the Euclidean loss based on depth range. However, a fixed transformation does not adapt to varying depth distributions within mini-batches, which may increase errors in scenarios with diverse depth profiles as the parameters were set to a fixed value.

To address this, an adaptive version of the DBE Loss is proposed. This Adaptive DBE Loss adjusts its parameters based on each mini-batch's depth distribution, enhancing depth prediction accuracy across diverse scenarios.
Note: Training Details and Datset remains same as before.

2 Modifications and Updated Code

To implement the Adaptive DBE Loss, a new loss function file was added to the codebase and further updated on the GitHub link, containing the dynamic parameter adjustments for each mini-batch. This helps the model to account for variations in depth profiles, reducing prediction errors. I have added updated_dbe.py file to the codebase.

3 Results and Performance Comparison

The table below presents the RMSE of the original and adaptive implementations, showing a clear improvement achieved through the Adaptive DBE Loss.

Method	RMSE
Original DBE Loss	2.3812
Adaptive DBE Loss (Proposed)	2.3522

Table 1: Comparison of RMSE between Original and Adaptive DBE Loss

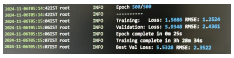

Figure 1: Screenshot of the error reuslts

4 Analysis of Improvement

The improvement from 2.3812 to 2.3522 in RMSE is because of the dynamic adjustment of the parameters concerning each minibatch instead of a fixed value in the start. The Adaptive DBE Loss offers more precise depth prediction across diverse scenarios, particularly in cases with substantial variation in depth profiles. This reduces generalization error, enhancing overall model performance.

References

[1] Jae-Han Lee, Minhyeok Heo, Kyung-Rae Kim, and Chang-Su Kim, *Single-Image Depth Estimation Based on Fourier Domain Analysis*, Korea University, 2018.

[2] Shalom Ma, *DEN: Depth Estimation Network*, GitHub repository, available at: `https://github.com/shalomma/DEN`, accessed November 2024.