3D Super-Resolution Model for Vehicle Flow Field Enrichment Supplementary Material

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In the paper manuscript, we only showed the difference between the generated high-resolution result and the ground truth of a SUV case in the test set for the page limitation. Also, only the velocity energy spectra of the same SUV case were showed for the same reason.This supplementary material provides additional results of difference comparisons and velocity energy spectra of other vehicle cases in the test set. In section A, we will show the difference comparisons of all the cases showed in Figure 5 of the paper manuscript. The SUV case will be shown once again because we add the generated results by the previous methods at this time. In section B, we will show the difference comparisons of training with different content loss. In section C, we will show the velocity energy spectra of other 4 cases except the SUV case which has been analyzed in the paper manuscript.

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A. Additional difference comparisons

Figure 1 $\sim$ Figure 5 show the difference comparison on several categories of vehicles. The generated high-resolution flow fields by different methods are close to the ground truth. It is difficult to find difference by just comparing with the ground truth. However, the differences between generated flow fields and the ground truth show that the proposed method outperforms the previous methods.

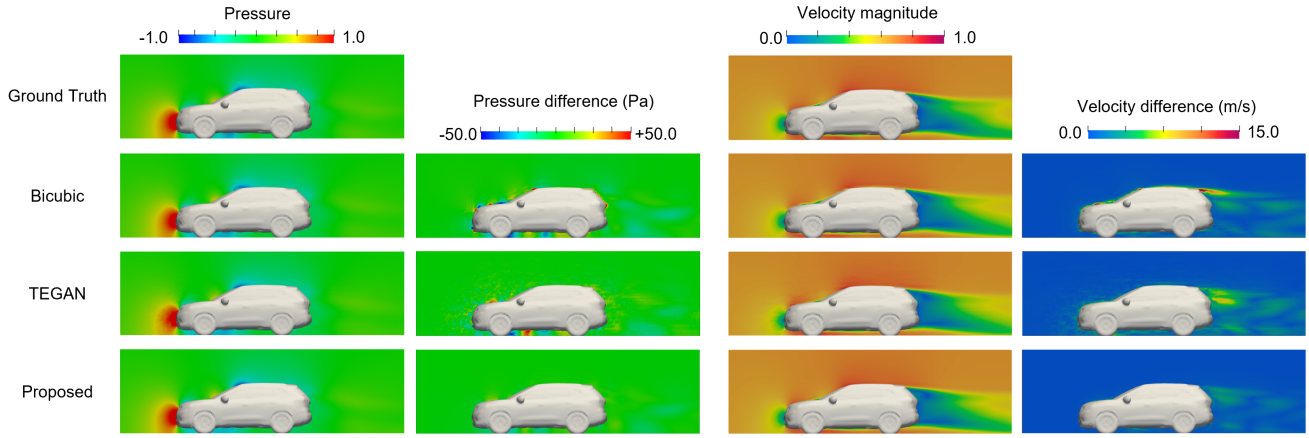

Figure 1. Differences comparison on an SUV case

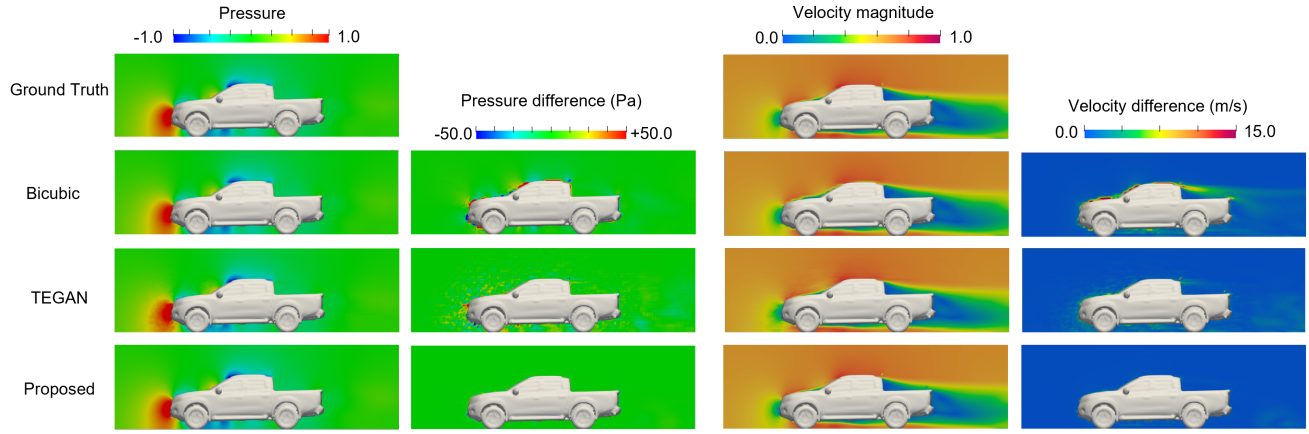

Figure 2. Differences comparison on a pickup truck case

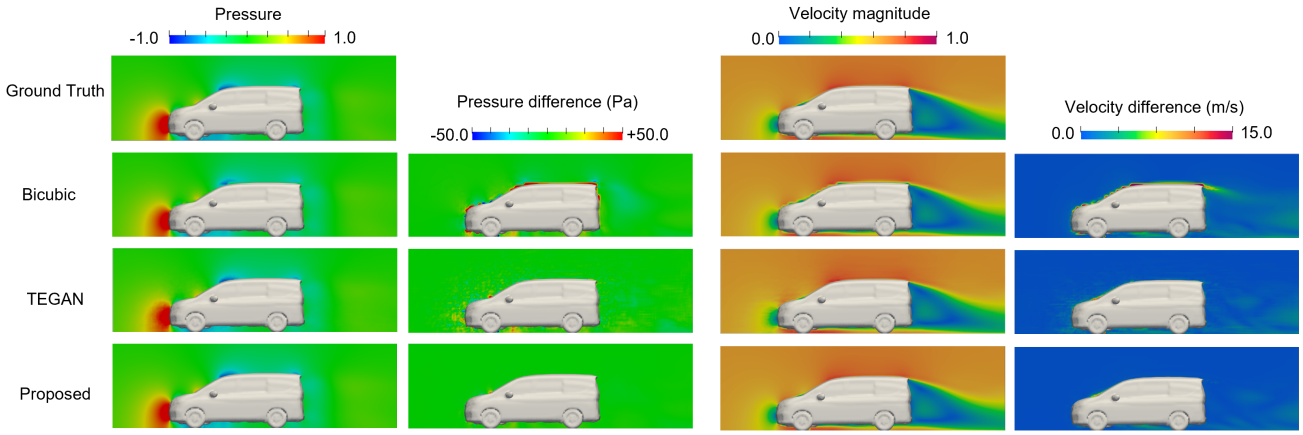

Figure 3. Differences comparison on a van case

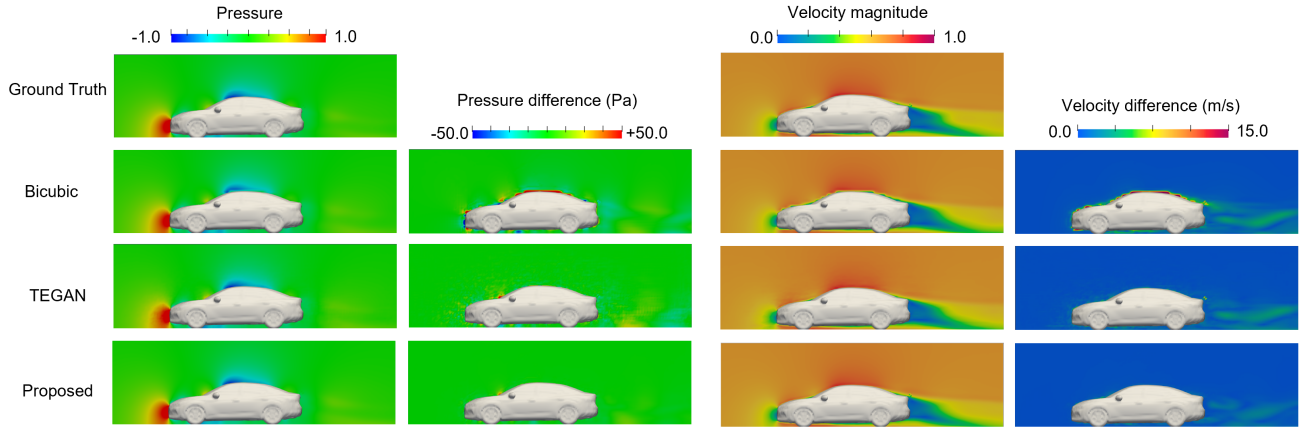

Figure 4. Differences comparison on a sedan case

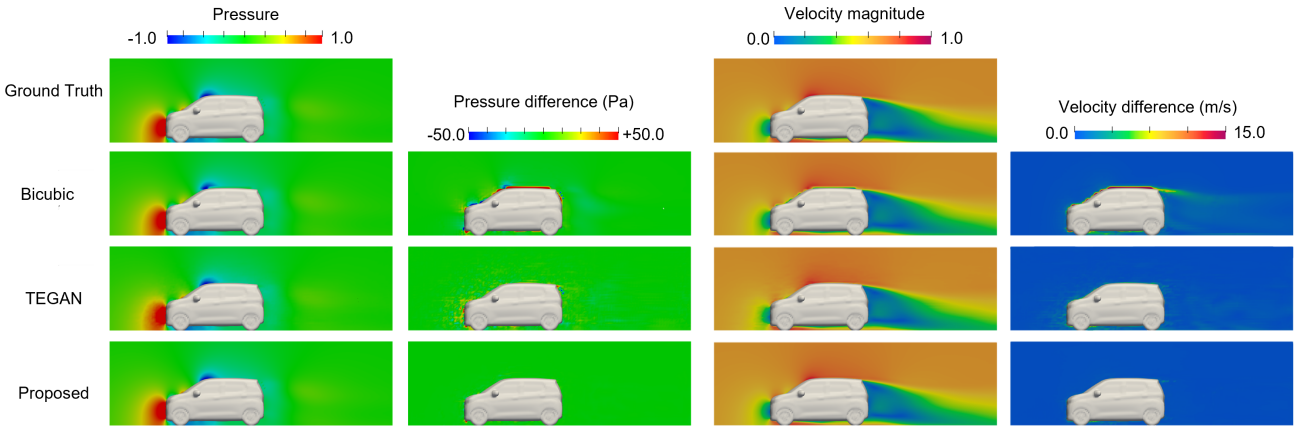

Figure 5. Differences comparison on a small car case

B. Additional difference comparisons of training with different content loss

Figure 6 $\sim$ Figure 9 show the difference comparisons on several categories of vehicles when training with different content loss. Compared with the MAE and MSE which are usually used as the content loss in the previous super-resolution studies, in our vehicle flow field enrichment task, the prospoed distance-weighted loss function contributes to reducing the error in the region near the surface. Although an overall improvement is shwon in the experimental evaluation and figures, there exists some cases which are learned well by training with MAE and MSE like the vehicle in Figure 9 so that the improvements might not be obvious. Moreover, there also exists some obvious errors shown in the figures though we improved the generation accuracy, we will continue improving the generation ability of the super-resolution model by making use of more domain knowledge like considering boundary conditions and imrpoving the model itself.

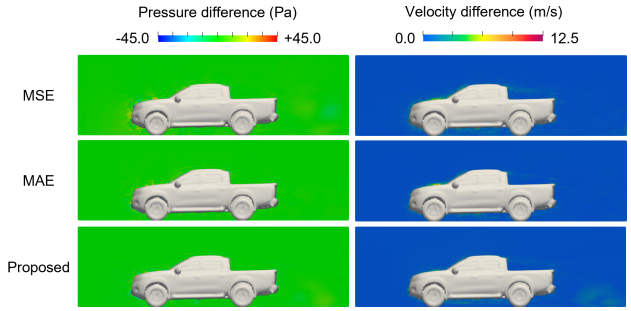

Figure 6. Differences comparison on a pickup truck case

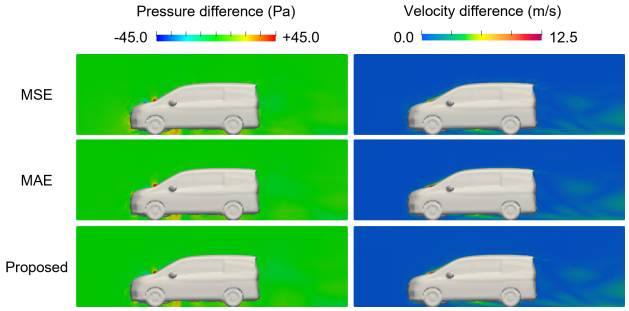

Figure 7. Differences comparison on a van case

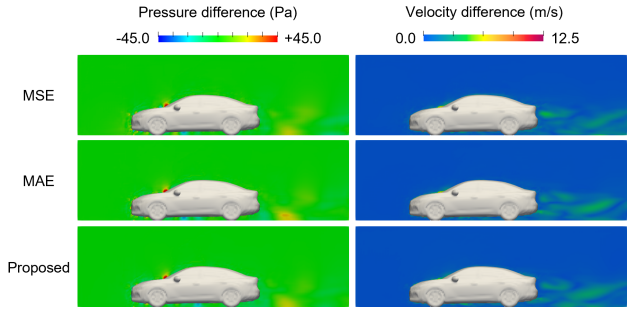

Figure 8. Differences comparison on a sedan case

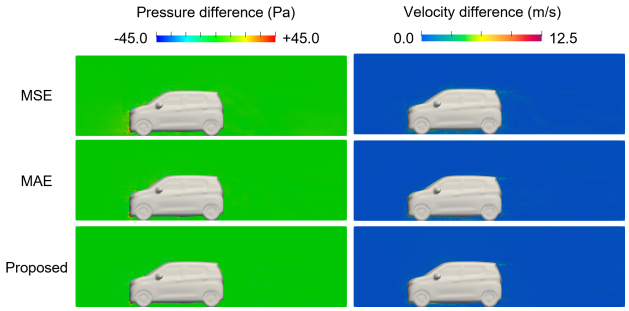

Figure 9. Differences comparison on a small car case

C. Additional velocity energy spectra results

Figure 10 $\sim$ Figure 13 show the velocity energy spectra of the other 4 cases of vehicles. Same as the result in the paper manuscript, the results on other vehicles also show that the proposed method benefits to generating high-frequency components of flow fields.

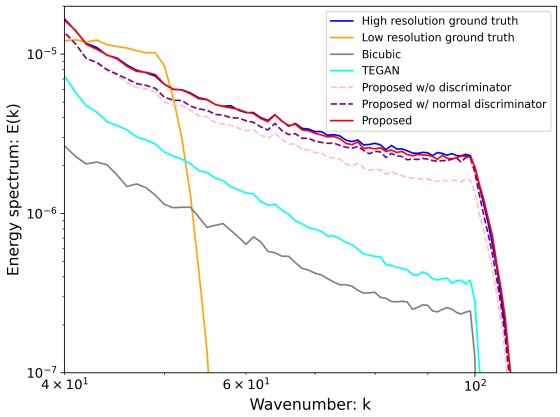

Figure 10. The velocity energy spectra of a pickup truck case

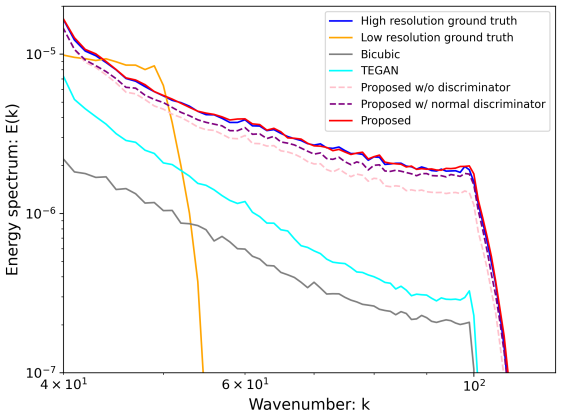

Figure 11. The velocity energy spectra of a van case

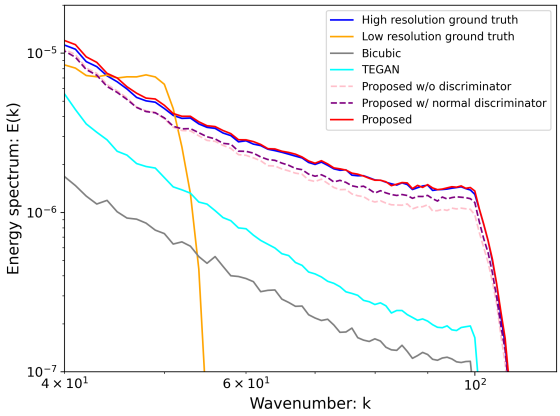

Figure 12. The velocity energy spectra of a sedan case

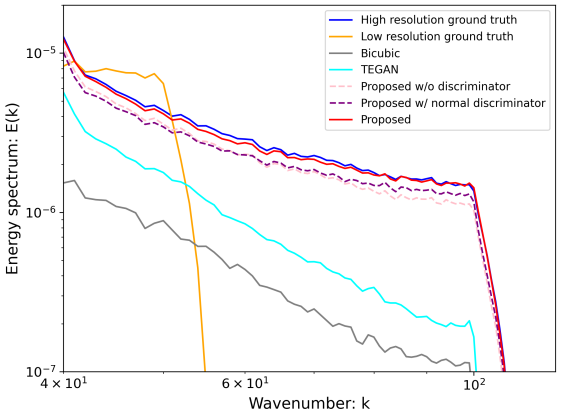

Figure 13. The velocity energy spectra of a small car case