

# Supplementary Material: ProFlow

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## 1 Visual Results

To make the improvements of our approach more explicit, we depict a selection of sequences that contain a variety of different scenarios, i.a. such as non-rigid deformations, occlusions and out-of-frame motion. These can be found in Fig. 1 – 3 (KITTI 2015) and Fig. 4 – 7 (MPI Sintel). On the one hand, one can see from the visualizations that predictions by the learned motion models (orange) are mainly used in occluded regions while the initial forward flow (turquoise) is used elsewhere. On the other hand, one can observe from the baseline and the final flow (our approach) that this typically leads to a noticeable improvement of the results.

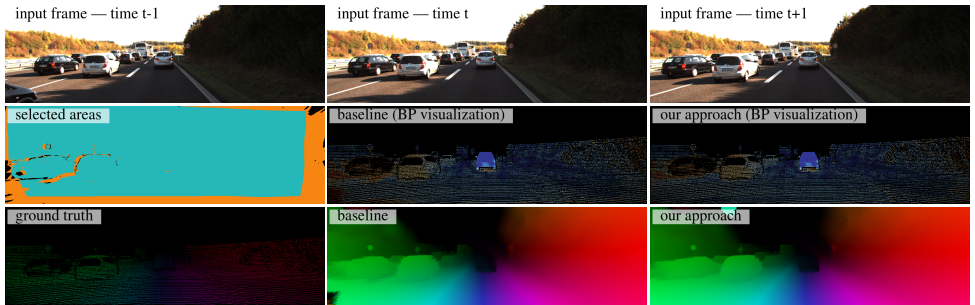


Figure 1: Visualization of improvements for Sequence #199 of KITTI 2015 [2].

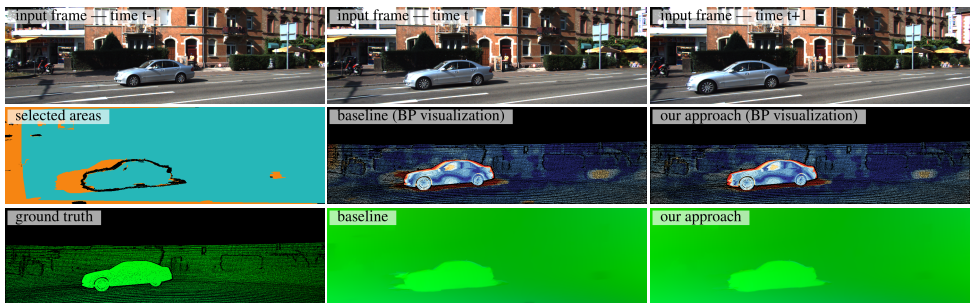


Figure 2: Visualization of improvements for Sequence #133 of KITTI 2015 [2].

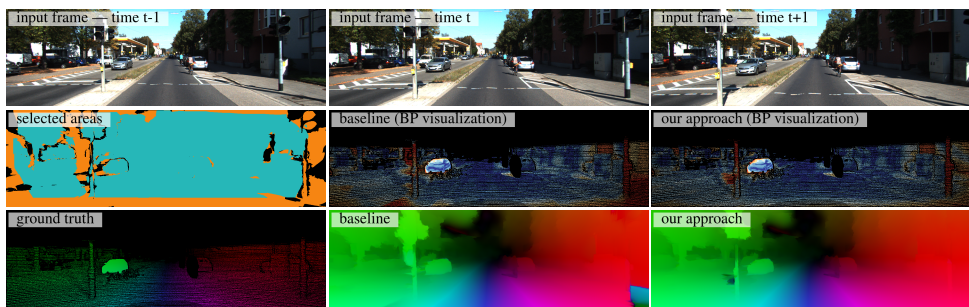


Figure 3: Visualization of improvements for Sequence #186 of KITTI 2015 [10].

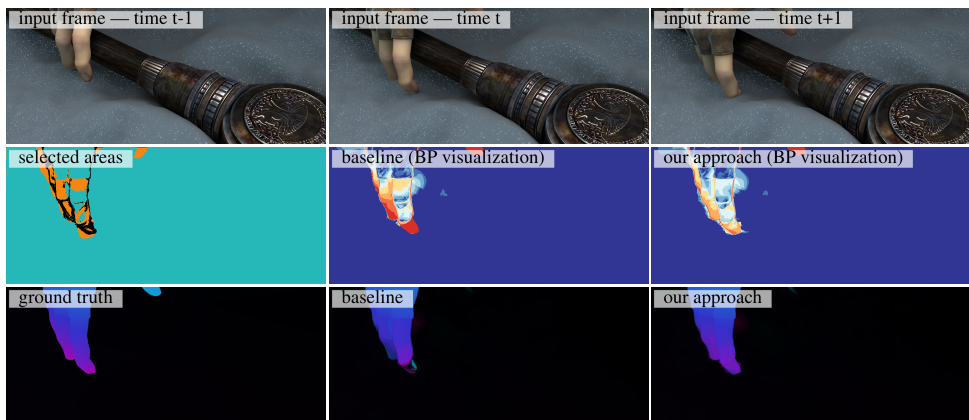


Figure 4: Visualization of improvements for the ambush\_7 sequence (#9) of MPI Sintel [10].

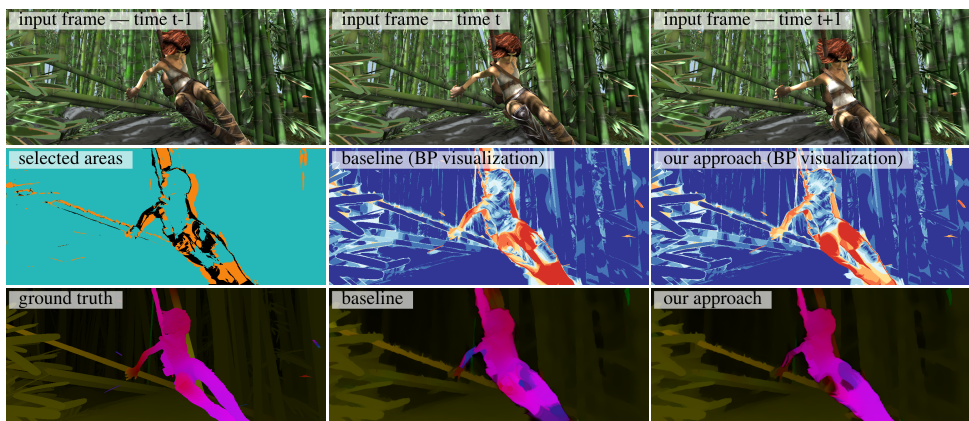


Figure 5: Visualization of improvements for the bamboo\_2 sequence (#43) of MPI Sintel [10].

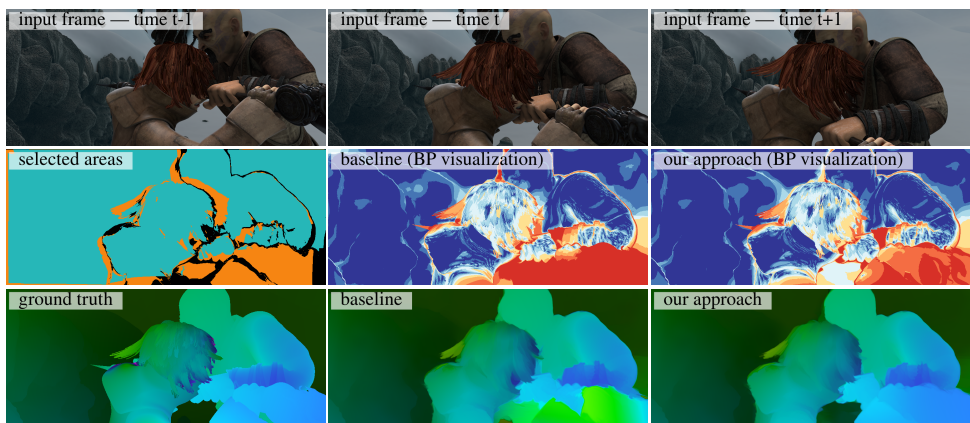


Figure 6: Visualization of improvements for the ambush\_5 sequence (#31) of MPI Sintel [1].

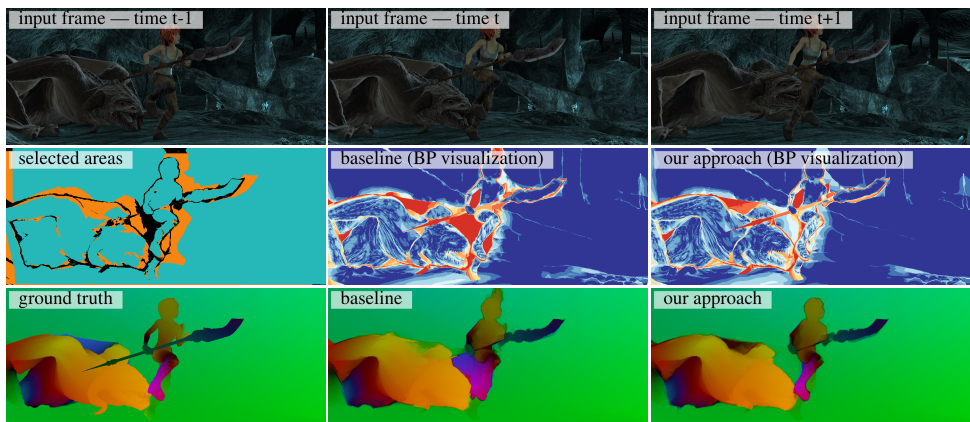


Figure 7: Visualization of improvements for the cave\_2 sequence (#13) of MPI Sintel [1].

## 2 Visualization of Intermediate Results

In order to provide a better insight into the overall approach, we show intermediate results of the different steps for the two exemplary sequences depicted in the main paper. These intermediate results are presented in Fig. 8 and Fig. 9. They include:

- (i) the three input images with the reference frame at time  $t$
- (ii) the initial forward and backward flow fields, the auxiliary flow fields (required to perform the bi-directional consistency check), as well as the filtered flow field
- (iii) the considered training samples, the predicted forward flow (computed using the backward flow and the learned motion model), and a bad pixel (BP) visualization of the predicted flow field
- (iv) the decisions within the combination step (turquoise=forward, orange=prediction), the inpainted combined flow field and the final flow estimate (refined combination)

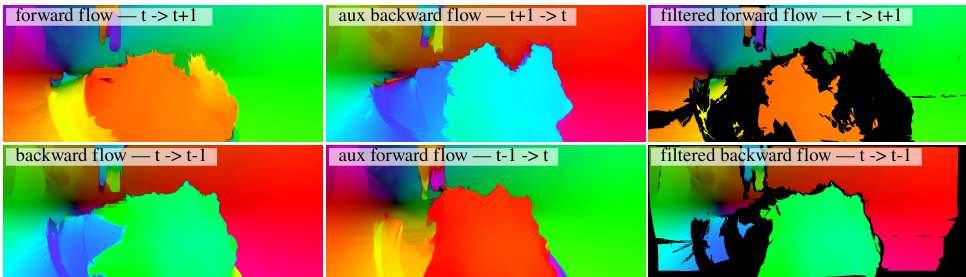
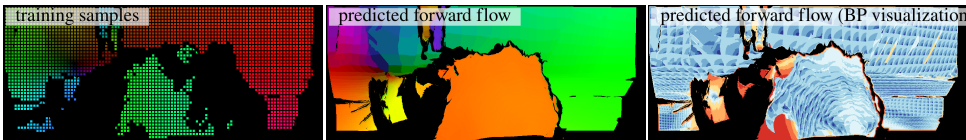
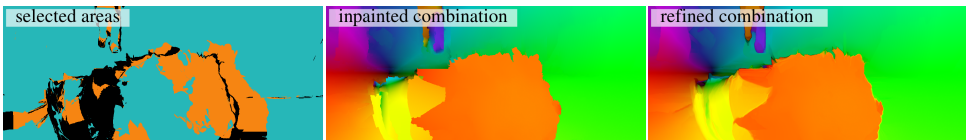
**(i) Input Frames****(ii) Initial Flow Estimation & Outlier Filtering****(iii) Model Learning & Prediction****(iv) Combination & Final Estimation**

Figure 8: Overview showing intermediate results of our optical flow approach for the market\_5 #8 sequence of the MPI Sintel benchmark [10].

## References

- [1] D. J. Butler, J. Wulff, G. B. Stanley, and M. J. Black. A naturalistic open source movie for optical flow evaluation. In *Proc. European Conference on Computer Vision*, pages 611–625, 2012.
- [2] M. Menze and A. Geiger. Object scene flow for autonomous vehicles. In *Proc. IEEE Conference on Computer Vision and Pattern Recognition*, pages 3061–3070, 2015.

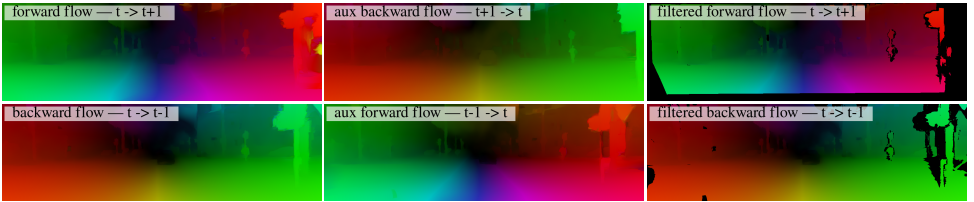
**(i) Input Frames****(ii) Initial Flow Estimation & Outlier Filtering****(iii) Model Learning & Prediction****(iv) Combination & Final Estimation**

Figure 9: Overview showing intermediate results of our optical flow approach for the #149 sequence of the KITTI 2015 benchmark [10].