Extending FlowNet to Integrate Past Information through Standard and Probabilistic Approaches

Abstract: Since the first formulation of the problem, optical flow estimation has improved significantly, and thanks to the recent progress of deep learning we now have algorithms that combine high accuracy with real-time performance. Although it is sometimes considered a solved problem, optical flow estimation remains a challenging task in critical cases such as occlusions, homogeneous regions, and ambiguities. Multi-frame algorithms represent a promising approach to address these weaknesses. In this work we propose three different sets of multi-frame flow algorithms, that aim at exploiting the information of the past motion trajectories. These algorithms are based on the combination of different flow candidates, which represent different information sources. To this end, we combine the FlowNet model with the most recent methods for multimodal probabilistic neural networks, and evaluate our algorithms on the well known MPI Sintel and KITTI benchmarks. The experimental results highlight the challenges of optical flow estimation on real-world data and of probabilistic estimation with deep learning models. In the best case, the performance gain of our models over the image pair baseline is comparable with the results found in the preexisting literature.