Figure 8: Real-world examples to evaluate the practical ability of different approaches.

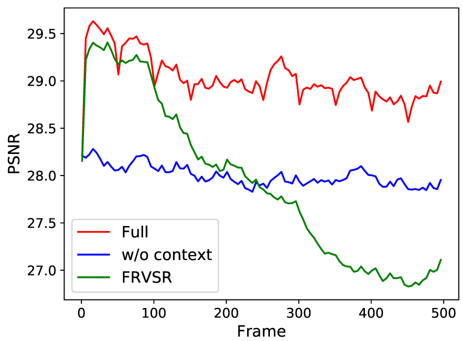

Figure 9: Performance of FRVSR, our full model, and "only local network" on *HongKong* as a function of the number of previous frames processed. Our suppression-updating algorithm can effectively depress iteration error of high-frequency information from previous frames processed.

HR image for 4x upsampling. Benefiting from directly taking advantage of previous features and frames, our approach is able to maintain real-time speed while producing high-quality temporal-coherency result.

RealWorld Examples

To evaluate the performance of our approach on real-world data, following (**?**), a visual comparison result is reported in Fig. 8. From the close-up images, we observe that our approach is able to recover the fine details and remove the blur artifacts, even though the model is trained on a set of LR-HR frame pairs, where the LR frames are obtained by performing bicubic down-sampling.

Suppressing Iteration Error of High-Frequency Information

Because the previous super-resolving errors are constantly accumulated to the subsequent frames, the super-resolved video has significant jitter and jagged artifacts when using previously inferred HR frames. Fig. 9 illustrates the performance of FRVSR, our full model, and "only local network" (without context network) on *HongKong*[2] as a function of the number of previous frames processed. It shows that the reconstruction accuracy of FRVSR approach is high in the early stage and decreased slightly in the low range of information flow (less than 100 frames), but it decreases dramatically when the number of previous frames processed is over 100, even worse than our "only local network". In contrast, benefiting from the proposed suppression-updating algorithm, our full model and "only local network" are not affected by the number of previous frames processed and both achieve stable performance. Interestingly, the "full model" outperforms "only local network" method in all frames, which intuitively demonstrates the key contribution of the context network NET_C. Fig. 10 shows a visual comparison of iteration error of high-frequency information. Our approach effectively removes the unpleasing flickering artifacts existed in FRVSR method.

[2]https://www.harmonicinc.com/free-4k-demo-footage/

Figure 10: Illustration of iteration error of high-frequency information.

Conclusion

In this paper, we presented a frame and feature-context video super-resolution approach. Instead of only exploiting multiple LR frames to separately generate each output frame, we propose a fully end-to-end trainable framework consisting of local network and context network to simultaneously utilize previously inferred frames and features. Furthermore, based on the characteristics of our framework, we propose a suppression-updating algorithm to effectively solve the problem of error accumulation of high frequency information. Extensive experiments including ablation study demonstrate that our approach significantly advances the state-of-the-art on a standard benchmark dataset and is capable of efficiently producing high-quality temporal-consistency video resolution enhancement.

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