DIGITAL VIDEO: PERCEPTION & ALGORITHMS

Assignment-2

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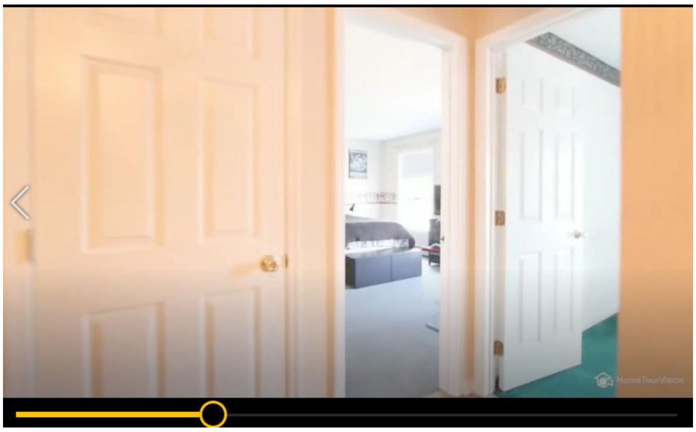
RESULTS (0001 video):

Q1.

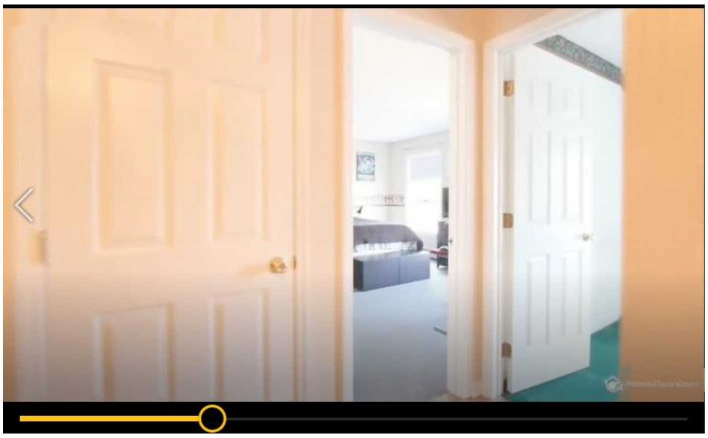
a. Pre-trained RAFT Model-

K=1: Sample Interpolated frame



Click on the video to play

K=2: Sample Interpolated frame



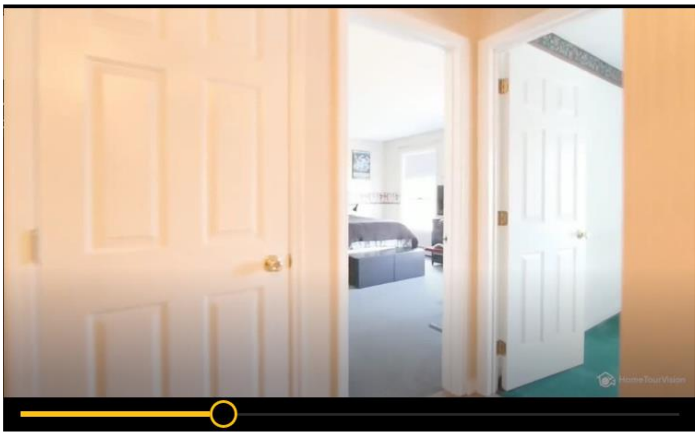
Click on the video to play

Pre-trained RAFT model	K=1	K=2
PSNR	35.87168	34.94731
LPIPS	0.13347	0.17589

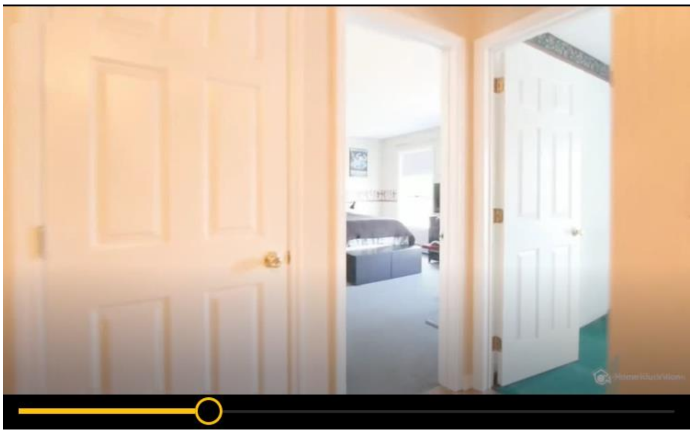
b. Fine tuning the number of steps

K=1: Sample Interpolated frame

K=2: Sample Interpolated frame



Click on the video to play



Click on the video to play

RAFT model in an unsupervised version	K=1	K=2
Optimal Iteration	19	28
PSNR	35.87207	34.94910
LPIPS	0.13369	0.17582

Finding Optimal Iteration number:

K=1:

ERRORS: [446.384686505353, 275.6333996808088, 262.601305926287, 260.8581718162254, 259.5508128978588, 259.093460083007, 258.909379182038, 259.1522380687572, 259.3984052870009, 259.7264020001447]

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1 index
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[1, 4, 7, 10, 13, 16, 19, 22, 25, 28]
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Optimal Iteration = 19

K=2:

ERRORS: [415.3805010760272, 263.9741403085214, 247.8069842303241, 244.6069669370298, 243.58659814905235, 242.85349075882522, 242.7734742341218, 242.62400026674626, 242.479732937283, 242.32536089861833, 243.25370675546156, 243.63279950177227, 243.72389842845777, 244.14860195583768, 244.09744884349684, 244.1685836226852, 244.1835259331597, 244.32931405526614, 244.36199894657847, 244.33543000397862]

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1 index
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[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58]
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Optimal Iteration = 28

Q2.

COMPARISON AND CONCLUSION:

1) The output of best version of *multi-scale Horn Schunk* was not as good as *RAFT method* both quantitively and qualitatively.
2) Best PSNR value for multi-scale Horn Schunk was less than both the methods using RAFT, indicating that RAFT have an upper edge while calculating Optical Flow. As higher psnr indicates better signal to noise ratio.
3) Best LPIPS value for multi-scale Horn Schunk was more than both the methods using RAFT, this also supports our observation that RAFT performs better while compared to methods like Horn Schunk. As lower lpips indicate better reconstruction of frame.
4) Multi-Scale Horn Schunk:
   Best PSNR- 29.8579, Best LPIPS-0.2009
5) Pre-trained RAFT:
   Best PSNR- 35.8716, Best LPIPS-0.1334
6) RAFT with Optimal Iteration:
   Best PSNR- 35.8720, Best LPIPS-0.1336

Therefore, RAFT's deep optical flow method provides a more robust, adaptable, and data-driven approach to optical flow estimation, enabling it to outperform the traditional multi-scale Horn-Schunck method in a variety of real-world scenarios. Its ability to learn and generalize from data, coupled with its advanced neural network architecture, contributes to its superior performance.

LINK FOR ORIGINAL RECONSTRUCTED VIDEO WITHOUT INTERPOLATION

Click here for K=1 video without interpolation
Click here for K=2 video without interpolation