Deep Homography-Based Video Stabilization

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Motivation
Amateur Video

https://www.pexels.com
Digital Video Stabilization

https://www.pexels.com

https://www.pexels.com
Traditional ≠ Deep Learning
Traditional x Deep Learning
Contributions

1. avoid relying on traditional feature extraction and tracking
2. address the problem definition issue in a DL context
3. our proposed system does not require video datasets that are specific for training DVS systems
Approach
Training
Video Stabilization

We can use the image alignment module
Video Stabilization

First approach
Video Stabilization

Second approach
Video Stabilization

- Based on previous experiments, n=20
- We limit scale:
  - $\text{Scale}(n-1) \times \frac{1}{2} \leq \text{Scale}(n) \leq \text{Scale}(n-1) \times 2$
- We crop each resulting frame: 5% from each edge
  - Top
  - Bottom
  - Left
  - Right
Experimental Results
Baseline

1. StabNet [12]: a DL-based method
2. Estadeo [29]: implements and compares classic digital video stabilization techniques and boundary conditions
3. Google Photos [30]: a commercial solution provided by Google, available on mobile phones
Metrics

- Metrics available at [11]:
- Mean MSE
- Mean SSIM
- Resolution Preservation (ResPrev): estimates how much a given frame has been cropped and deteriorated in the output videos
- Mean distance between features (dx and dy): measures how much a given feature has moved between ground truth and stabilized videos
Video Stabilization
Conclusions
Conclusions

• We combine
  • STNs and their ability to align two images
  • the simplicity of smoothing videos with moving averages
• Experimental results showed
• Our proposed system can stabilize videos even in challenging scenarios
• Demo: https://youtu.be/gOzjOREylaE
Thank you!

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