Deep Homography-Based Video Stabilization

Maria Ito

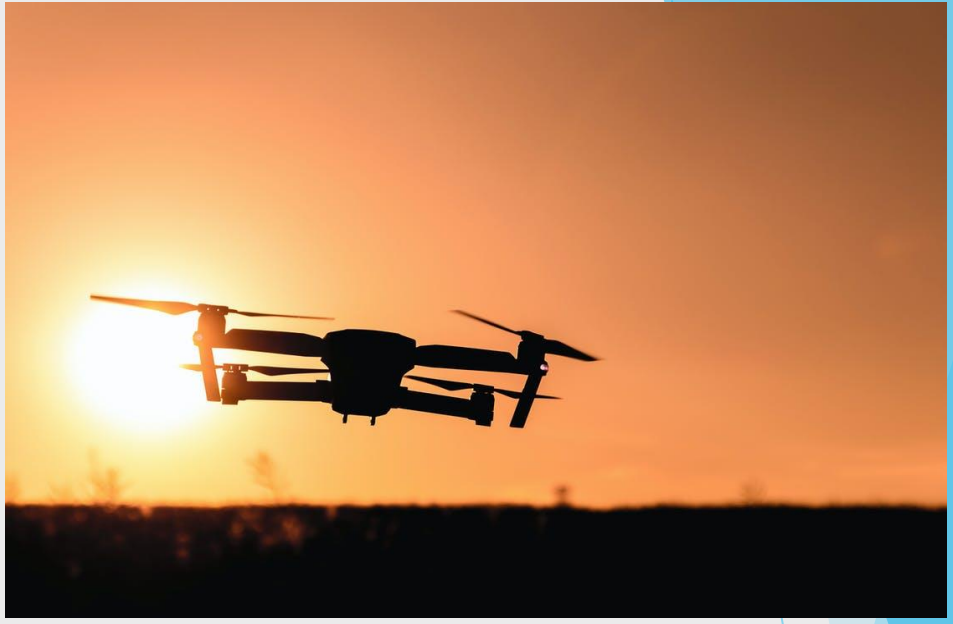
Ebroul Izquierdo

Queen Mary University of London, UK

Presented by: Maria Ito

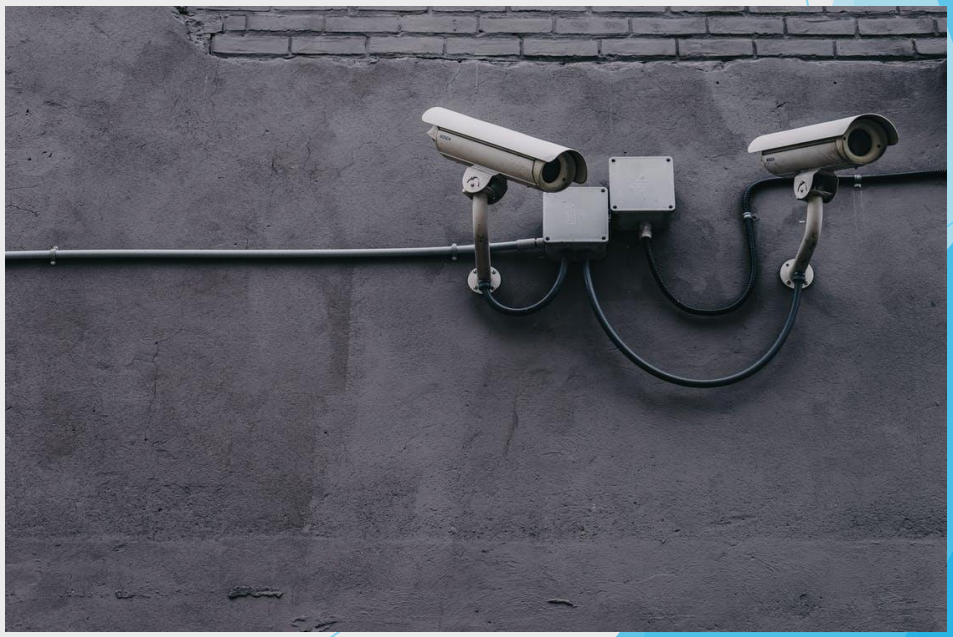
Motivation

Amateur Video



https://www.pexels.com

https://www.billboard.com



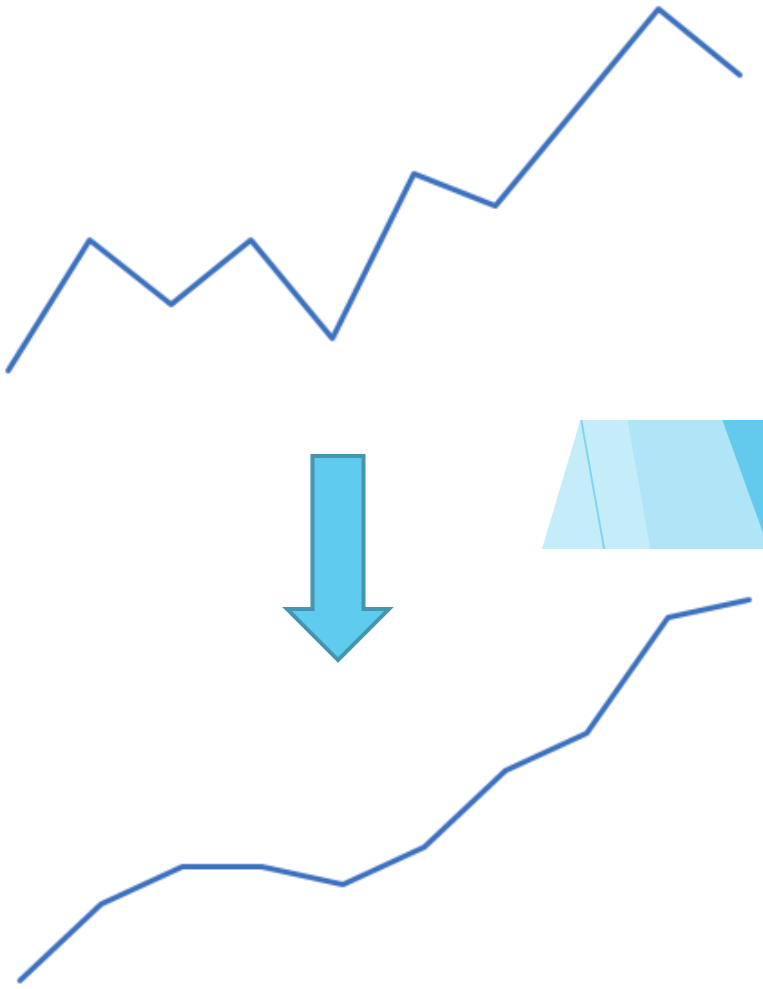
https://www.pexels.com

Digital Video Stabilization

https://www.pexels.com

https://www.pexels.com

Traditional x Deep Learning



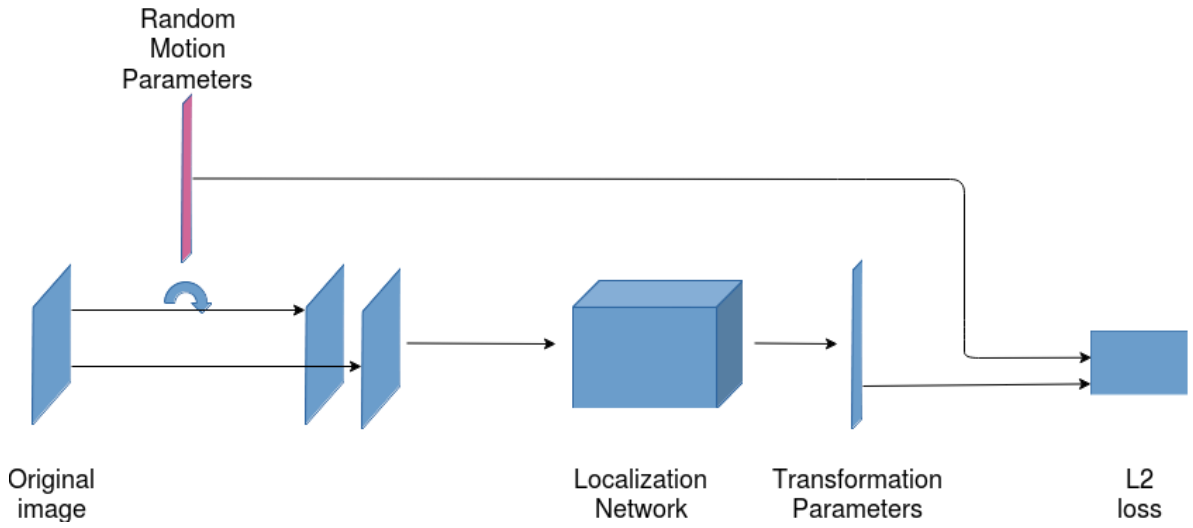
Traditional x Deep Learning

Contributions

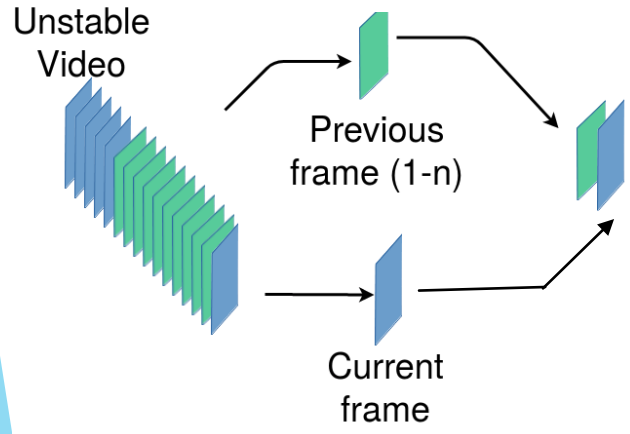
1. avoid relying on traditional feature extraction and tracking
2. address the problem definition issue in a DL context
3. our proposed system does not require video datasets that are specific for training DVS systems

Approach

Training

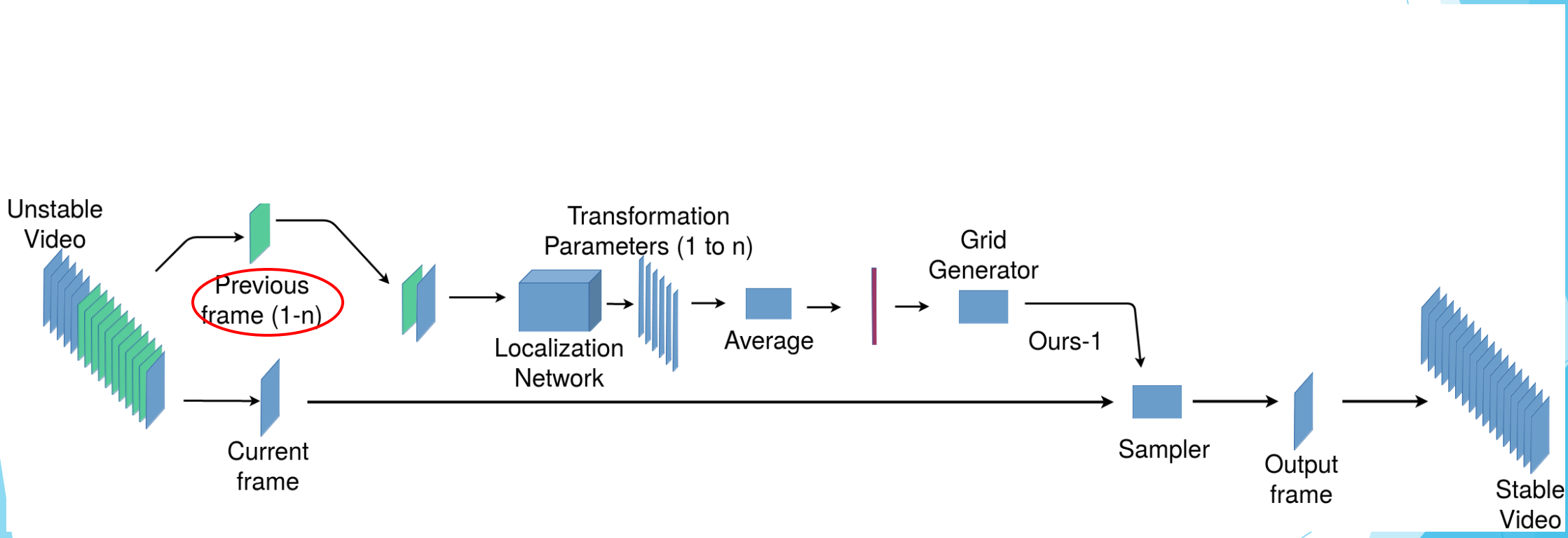

Random
Motion
Parameters
Original
image
Localization
Network
Transformation
Parameters
L2
loss

Video Stabilization



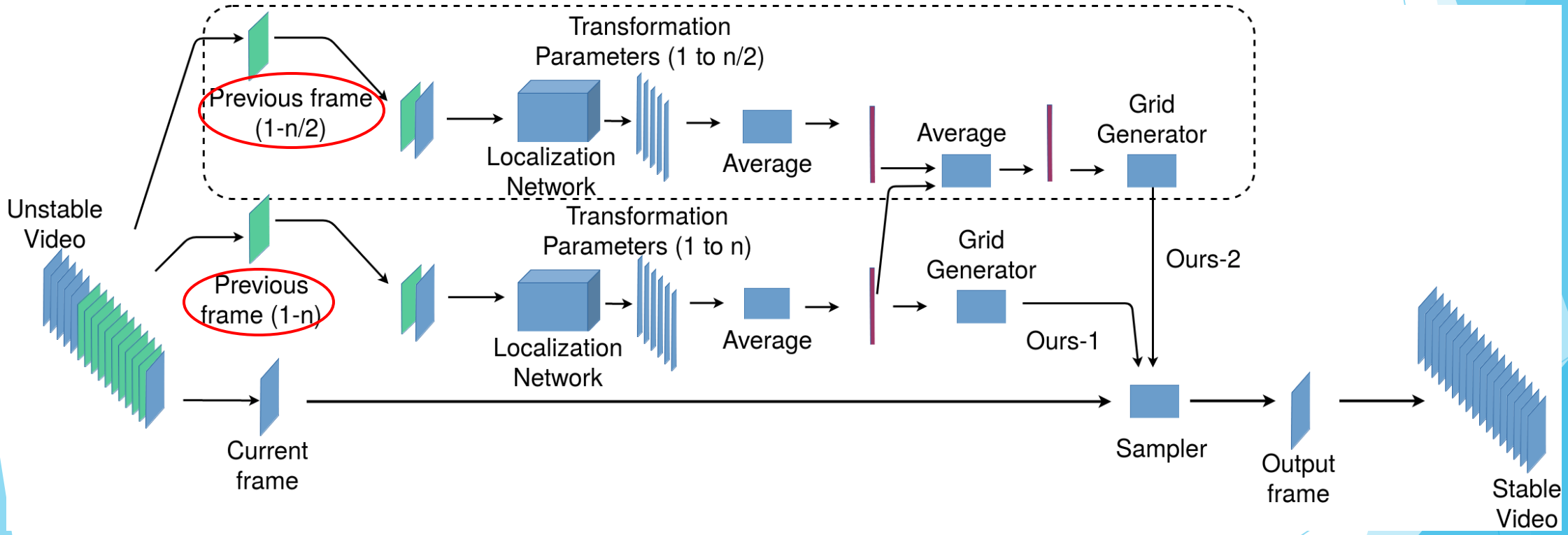
We can use the image alignment module

Video Stabilization



First approach

Video Stabilization



Second approach

Video Stabilization

- Based on previous experiments, n=20
- We limit scale:
  - $Scale(n-1) * ½ \leq Scale(n) \leq Scale(n-1) * 2$
- We crop each resulting frame: 5% from each edge
  - Top
  - Bottom
  - Left
  - Right

Experimental Results

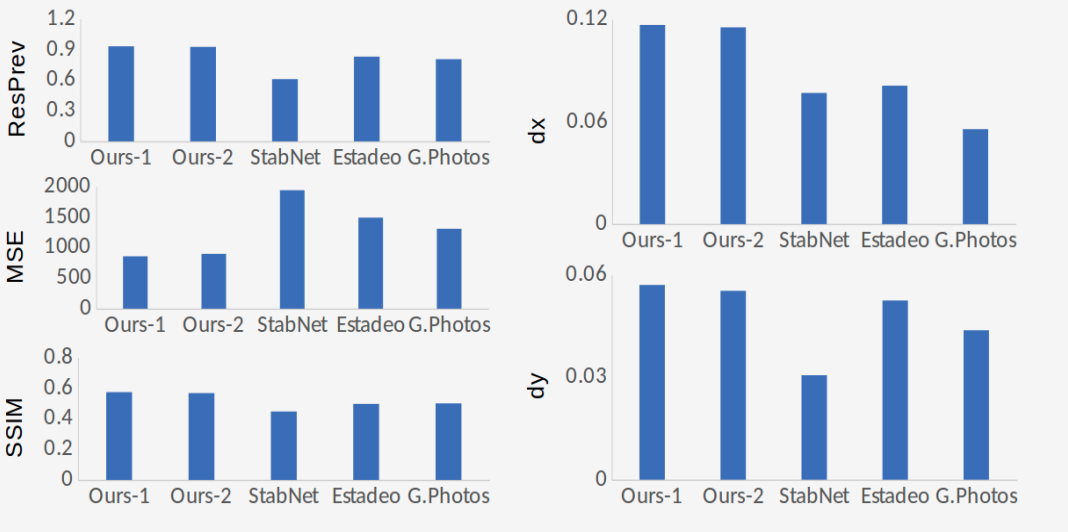
Baseline

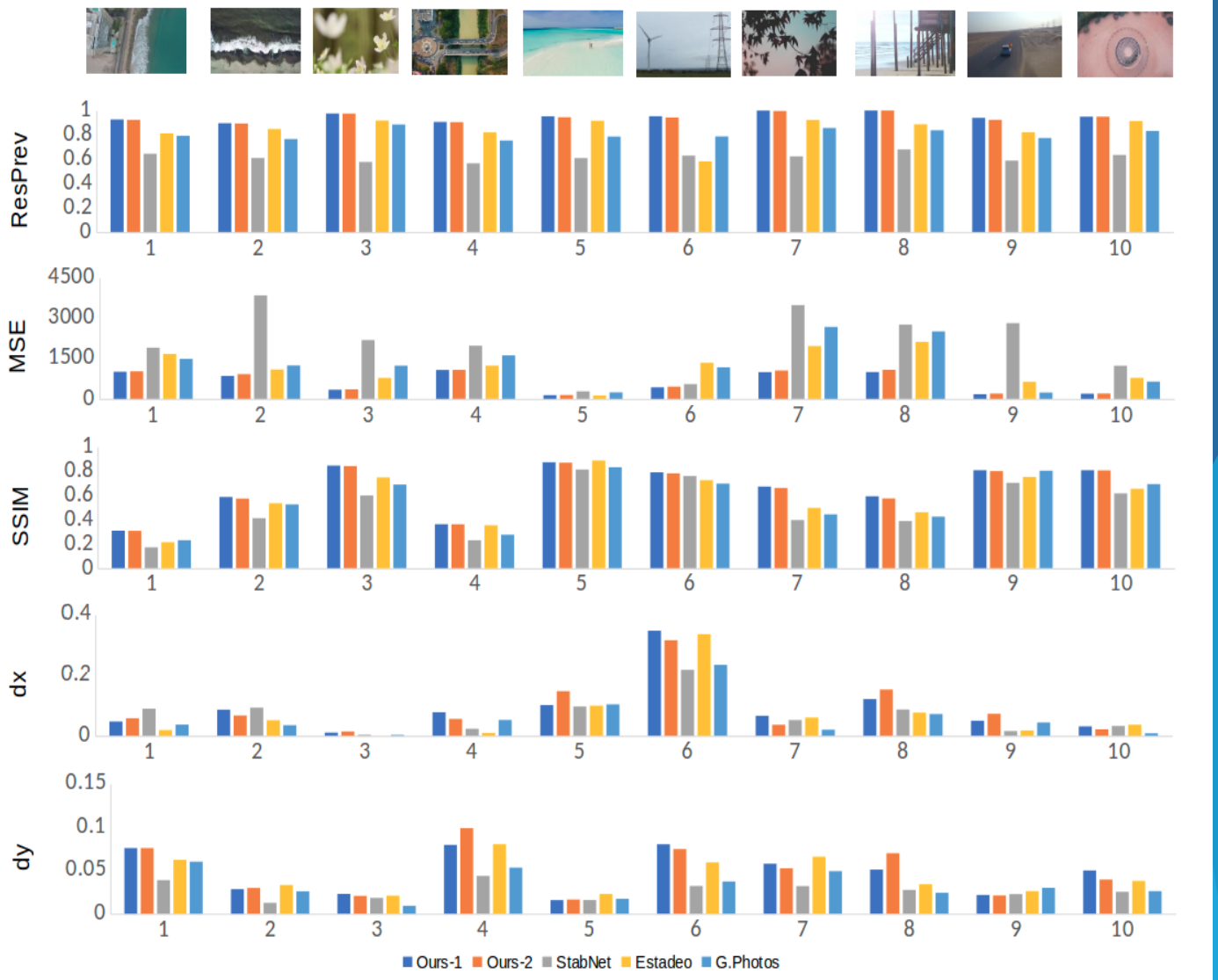
1. StabNet [12]: a DL-based method
2. Estadeo [29]: implements and compares classic digital video stabilization techniques and boundary conditions
3. Google Photos [30]: a commercial solution provided by Google, available on mobile phones

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/gOzjOReyIaE

Thank you!

Maria Ito

m.s.ito@qmul.ac.uk