



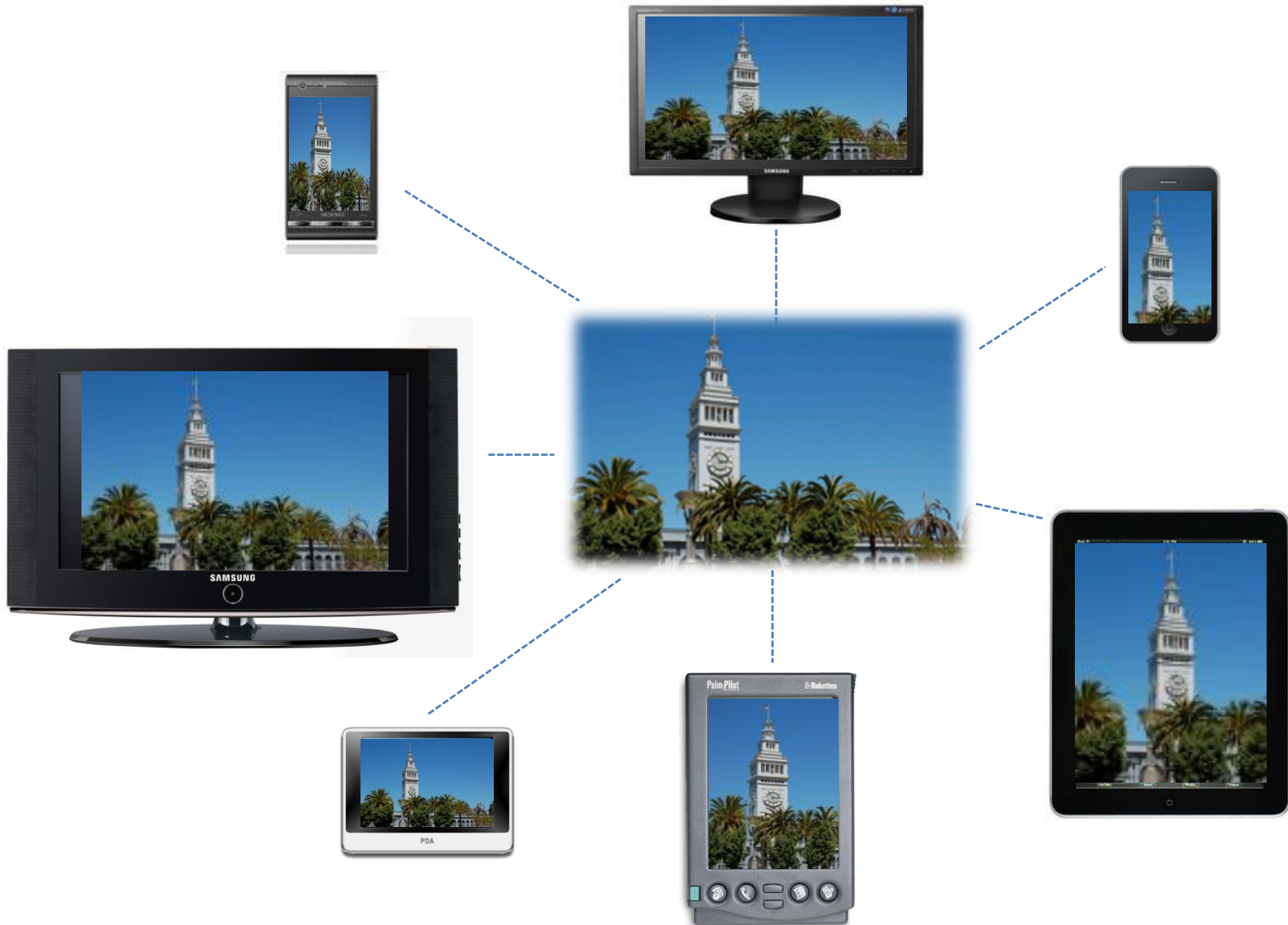
# Image Retargeting Assessment based on Salient Region Similarity

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# Image Retargeting



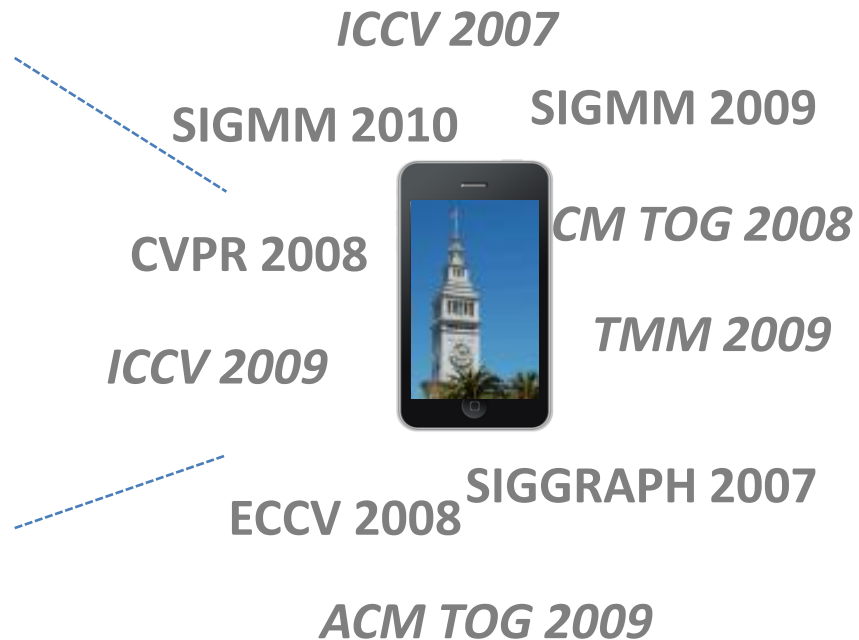
# Image Retargeting



**Scaling**



**Letter boxing**



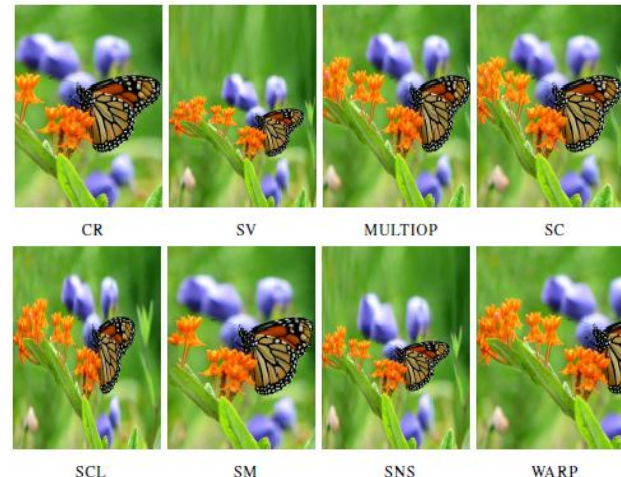
# Image Retargeting Assessment

## Current Assessment Methods

RetargetMe [Rubinstein TOG'10]

Author	Metric	Publisher
Simakov et al.	BDS	CVPR'08
Rubinstein et al.	BDW	TOG'09
Manjunath et al.	EH	ICCV'01
Kasutani et al.	CL	ICIP'02
Liu et al.	SIFTflow	ECCV'08
Pele et al.	EMD	ICCV'09

- no method is satisfactory for any original image
- Current assessment methods are in low agreement with human perception



# Our Approach

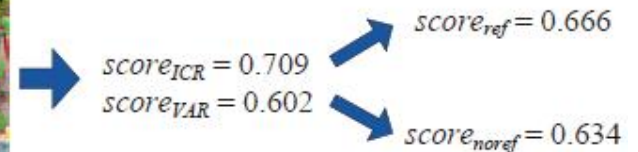
- Assessment criteria
  - Important content retainment
  - Visual artifact reduction
- Basic idea
  - Measure Salient Region Similarity (SRS) in original image and target image



Original image Target image



Salient regions matching



Assessment result

# SRS Measurement

- Limitations of SIFT in retargeting assessment
  - Large rotation will cause distortion
  - Color is weakly changed in resizing
- Salient Region Detection and Matching

$$\text{sim}(r_i, r_j) = \text{sim}(f_i^{\text{gra}}, f_j^{\text{gra}}) \cdot \text{sim}(f_i^{\text{HSV}}, f_j^{\text{HSV}}) \cdot \cos \theta$$

Gradient histogram

HSV color histogram

Angle difference



# SRS based Assessment

- Important content retainment Assessment

$$score_{ICR} = \frac{\sum_i s_i^{ori} M(r_i^{ori})}{\sum_i s_i^{ori}}$$

- Visual artifact reduction Assessment

$$score_{VAR} = \frac{\sum_j s_j^{tar} M(r_j^{tar})}{\sum_j s_j^{tar}}$$

- Total score

$$score = w_{ICR} \cdot score_{ICR} + w_{VAR} \cdot score_{VAR}$$

# Experiments

- Dataset (RetargetMe)
  - 37 original images
  - 8 target images for each original images
  - 2 versions of manual evaluation results by 21 participants



Reference



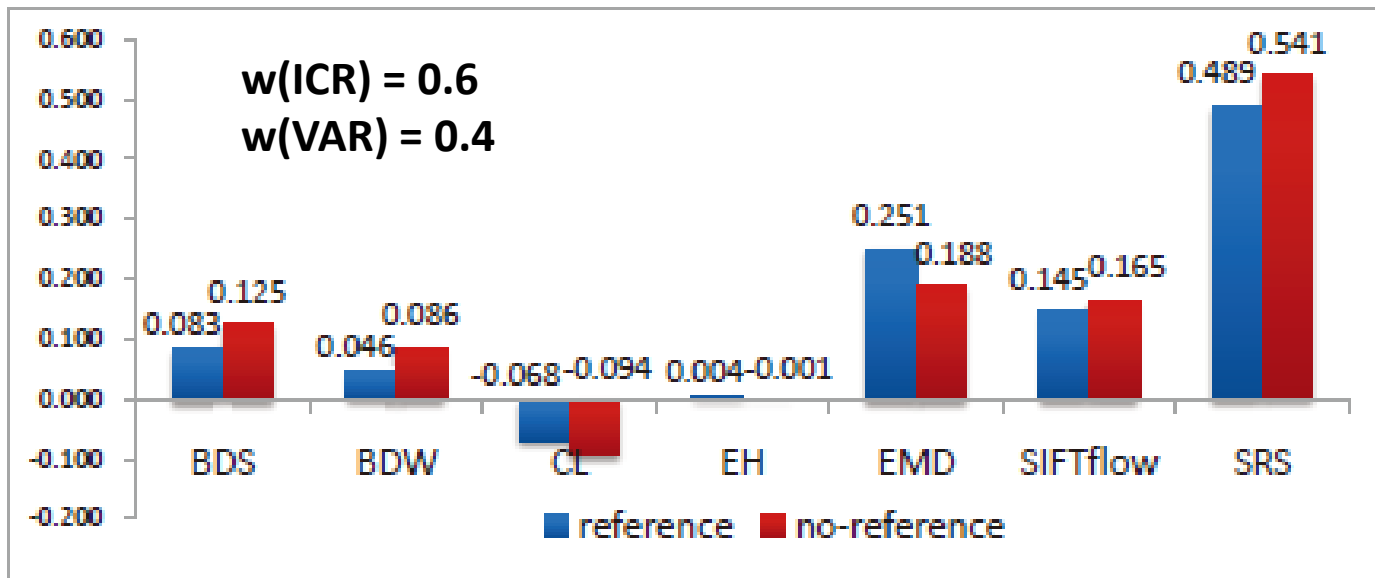
Non-reference



# Experiments

- Agreement with Manual Evaluation
  - Kendall Rank Correlation Coefficient

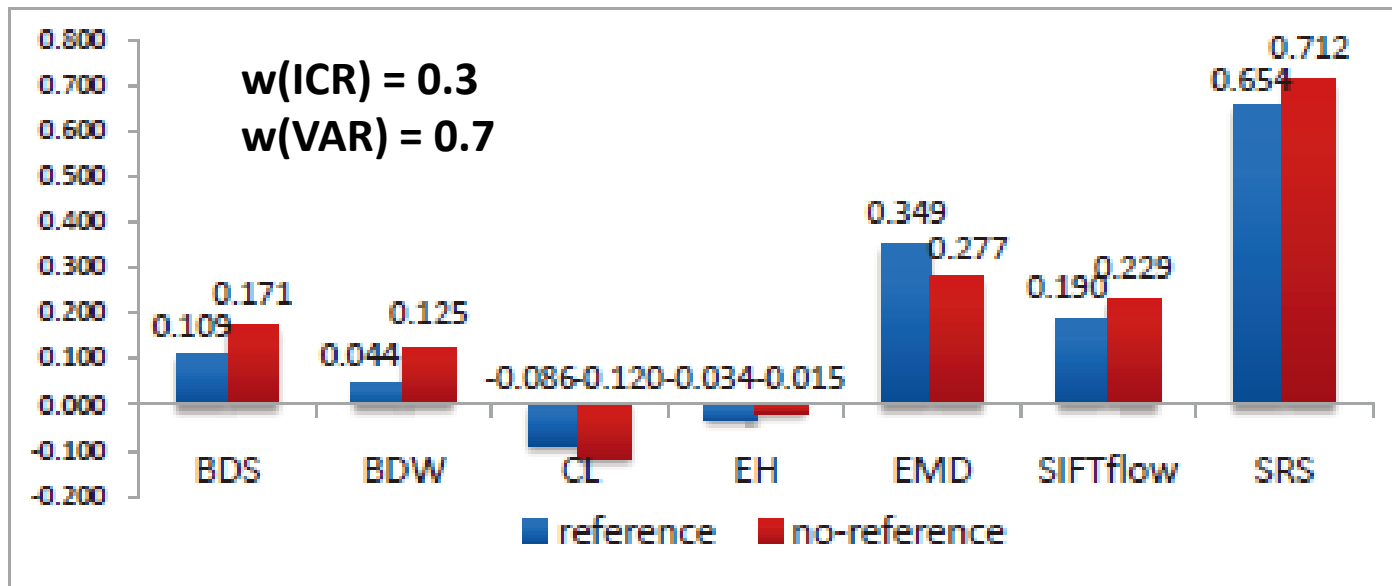
$$\tau = \frac{\sum_{i=1}^{n_{org}} \binom{n_{tar}}{2} C(i)}{n_{org} \binom{n_{tar}}{2}}$$



# Experiments

- Agreement with Manual Evaluation
  - *Weighted* Kendall Rank Correlation Coefficient

$$\tau^* = \frac{\sum_{i=1}^{n_{org}} \binom{n_{tar}}{2} w_i C(i)}{\sum_{i=1}^{n_{org}} \binom{n_{tar}}{2} w_i}$$



# Failure Examples

- Discussion
  - dominant object occupies large area



- saliency detection is not accurate



# Conclusion

- Contribution
  - built our assessment on two criteria generated from human perception
  - propose a simple and effective assessment approach
- Future work
  - apply our assessment to improve image retargeting methods
  - extend the approach to video retargeting assessment

**Thank you**