Image Retargeting Assessment based on Salient Region Similarity

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Image Retargeting
Image Retargeting

Scaling

Letter boxing

ICCV 2007
SIGMM 2010
SIGMM 2009
CVPR 2008
ICCV 2009
SIGGRAPH 2007
ECCV 2008
TMM 2009
SIGMM 2010
CM TOG 2008
ACM TOG 2009
Image Retargeting Assessment

Current Assessment Methods

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<td>Rubinstein et al.</td>
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| Liu et al.      | SIFTflow | ECCV’08 |}

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

[RetargetMe][Rubinstein TOG’10]
Our Approach

• Assessment criteria
  – Important content retention
  – 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

\[ \text{score}_{ICR} = 0.709 \]
\[ \text{score}_{VAR} = 0.602 \]
\[ \text{score}_{noRef} = 0.634 \]
SRS Measurement

• Limitations of SIFT in retargeting assessment
  • Large rotation will cause distortion
  • Color is weakly changed in resizing

• Salient Region Detection and Matching

\[ \text{sim}(r_i, r_j) = \text{sim}(f_i^{\text{gra}}, f_j^{\text{gra}}) \cdot \text{sim}(f_i^{\text{HSV}}, f_j^{\text{HSV}}) \cdot \cos \theta \]
SRS based Assessment

• Important content retention Assessment

\[ \text{score}_{ICR} = \frac{\sum_i s_i^{ori} M(r_i^{ori})}{\sum_i s_i^{ori}} \]

• Visual artifact reduction Assessment

\[ \text{score}_{VAR} = \frac{\sum_j s_j^{tar} M(r_j^{tar})}{\sum_j s_j^{tar}} \]

• Total score

\[ \text{score} = w_{ICR} \cdot \text{score}_{ICR} + w_{VAR} \cdot \text{score}_{VAR} \]
Experiments

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

• Agreement with Manual Evaluation
  – Kendall Rank Correlation Coefficient

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

\[
w(IKR) = 0.6 \quad w(VAR) = 0.4 \]
Experiments

• Agreement with Manual Evaluation
  – *Weighted* Kendall Rank Correlation Coefficient

\[
\tau^* = \frac{\sum_{i=1}^{n_{org}}{C(i)w_i}}{\sum_{i=1}^{n_{org}}{\left(\frac{n_{tar}}{2}\right)w_i}}
\]

\[w(\text{ICR}) = 0.3\]
\[w(\text{VAR}) = 0.7\]
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