



# Advertise Gently – In-Image Advertising with Low Intrusiveness

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- Motivation
- The measurement of intrusiveness
- The proposed in-image advertising method
- Conclusion



# Motivation-(1)

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- Tons of images on the web





# Motivation-(1)

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- In-image advertising is on its way

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- In-image advertising is on its way

BritePic: <http://www.britepic.com/>



Logo

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- In-image advertising is on its way

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Logo

# Motivation-(1)

- Tons of images on the web



- In-image advertising is on its way

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Logo



Intrusive



Logo



# Motivation-(2)

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- ROI (Region of Interest) interference
  - Visual attention
  - Lower attentive region

[1] T. Mei. "Contextual In-Image Advertising", MM '08

[2] H. Liu. "A Generic Virtual Content Insertion System Based on Visual Attention Analysis", MM'08



# Motivation-(2)

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- ROI (Region of Interest) interference
  - Visual attention
  - Lower attentive region



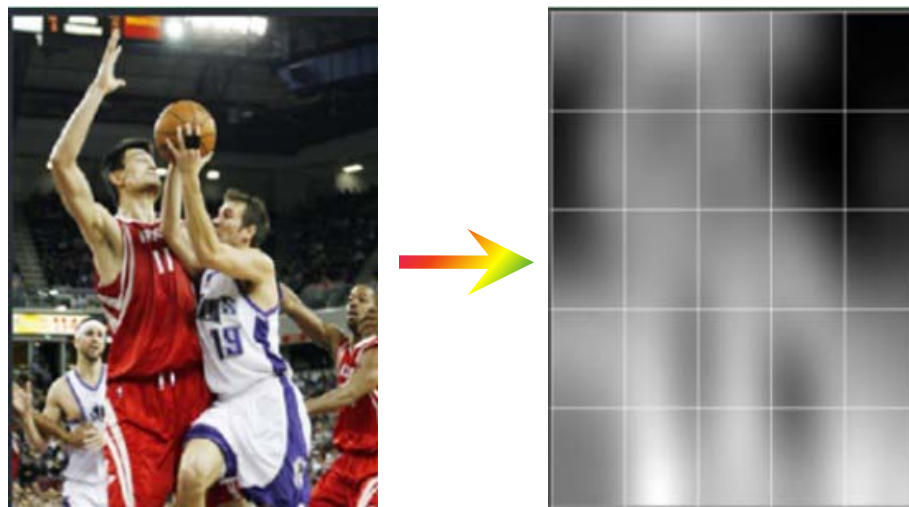
[1] T. Mei. "Contextual In-Image Advertising", MM '08

[2] H. Liu. "A Generic Virtual Content Insertion System Based on Visual Attention Analysis", MM'08

[www.jdl.ac.cn](http://www.jdl.ac.cn)

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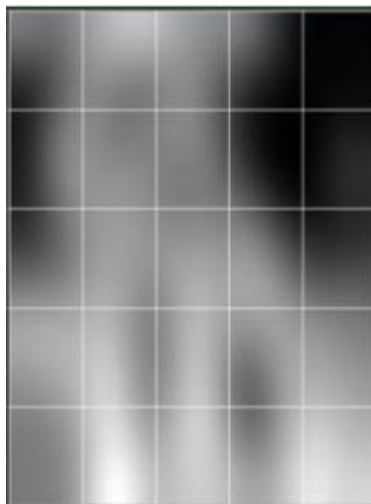
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# Motivation-(2)

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# Motivation-(3)

- Distraction
  - Visual consistency



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# Motivation-(3)

- Distraction
  - Visual consistency
    - Visually similar region



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# Motivation-(3)

- Distraction
  - Visual consistency
    - Visually similar region
    - Harmonization



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# Our Goal

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- Measure intrusiveness
  - ROI interference
  - Distraction
- Reduce intrusiveness
  - Reduce the intrusiveness between a photo and an Ad
  - Reduce the total intrusiveness between an album and an Ad set



# Measure Intrusiveness-(1)

- Experiment setting
  - Image: 6 albums, each include 50 photos.
  - Insertion Ad, randomly chosen from 75 brands
  - Insertion position: randomly chosen from marginal blocks
  - 6\*50 insertion results





# Measure Intrusiveness-(2)

---

- User study
  - Task 1: Pick out the intrusive ones
    - 14-18 users for each album, 20-30 years old
  - Task 2: Pick out the ones of ROI covering
    - 3-4 user for each album, 20-30 years old



# Measure Intrusiveness-(2)

---

- User study
  - Task 1: Pick out the intrusive ones
    - 14-18 users for each album, 20-30 years old
  - Task 2: Pick out the ones of ROI covering
    - 3-4 user for each album, 20-30 years old

Conclusion 1  
ROI interference is definitely intrusive



# Measure Intrusiveness-(3)

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- Insertion result classification
  - A: non intrusive
  - B: distractive
  - C: ROI interference



# Measure Intrusiveness-(3)

- Insertion result classification
  - A: non intrusive
  - B: distractive
  - C: ROI interference

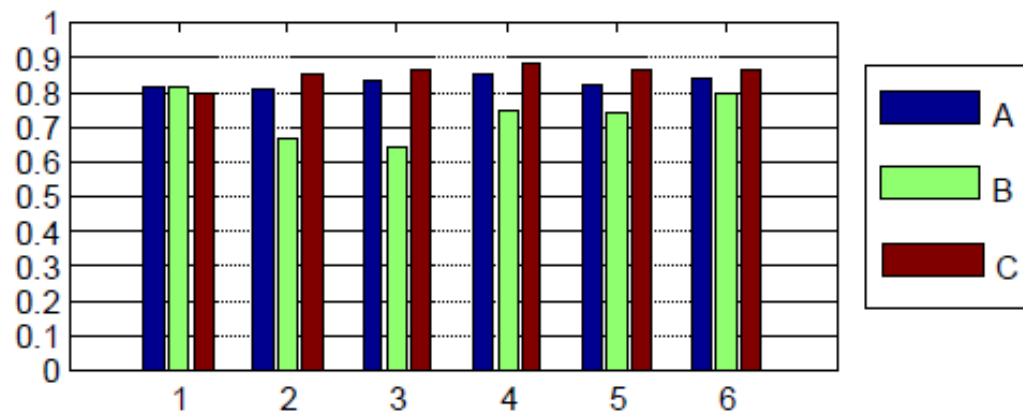
	1	2	3	4	5	6
A	36	39	35	28	30	26
B	6	5	8	11	18	23
C	8	6	7	11	2	1



# Measure Intrusiveness-(4)

- Consistency between attention maps

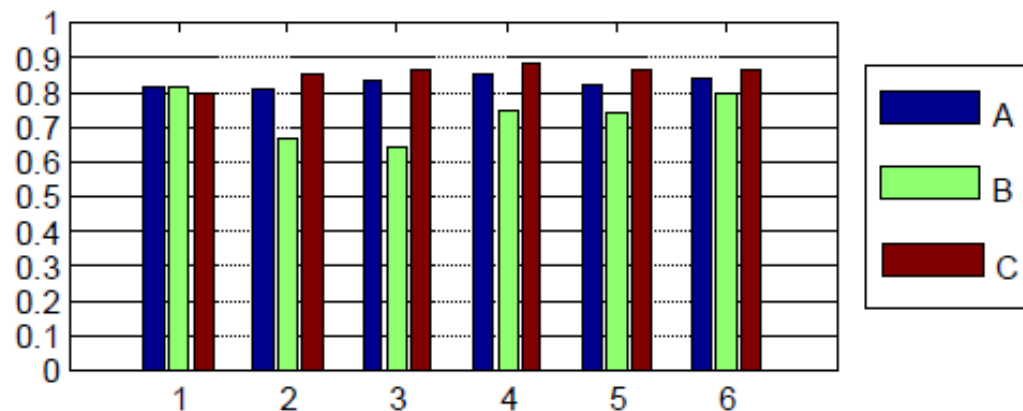
$$con = \sum_{(x,y)} \min(AM_{before}(x,y), AM_{after}(x,y))$$



# Measure Intrusiveness-(4)

- Consistency between attention maps

$$con = \sum_{(x,y)} \min(AM_{before}(x,y), AM_{after}(x,y))$$



## Conclusion 2

Distraction causes more change of attention while ROI interference causes less

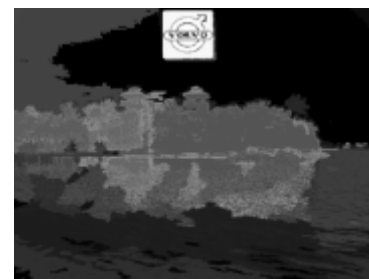
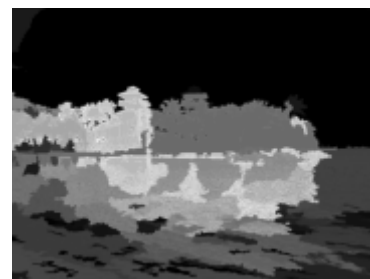


# Measure Intrusiveness-(5)

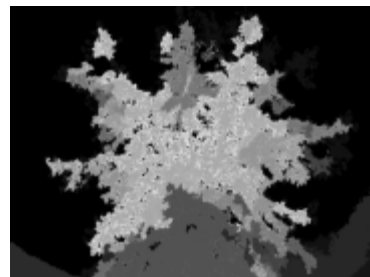
A: "Good" Results



B: Distraction



C: ROI Interference







# Measure Intrusiveness-(6)

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- Intrusiveness
  - ROI interference
    - Maximum
  - Distraction
    - Consistency of attention maps

$$Intr = \begin{cases} 1 & \text{ROI interference} \\ 1 - con & \text{others} \end{cases}$$



# Reduce Intrusiveness-(1)

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- Find the position of minimum intrusiveness





# Reduce Intrusiveness-(1)

- Find the position of minimum intrusiveness



Attention  
analysis

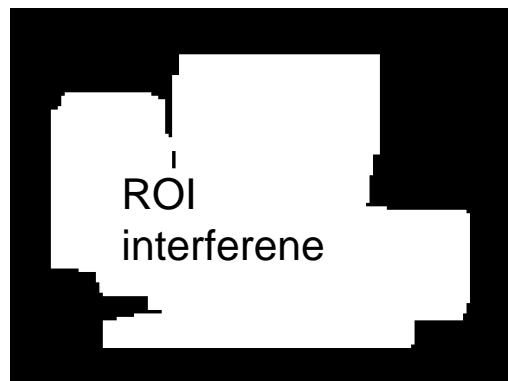


# Reduce Intrusiveness-(1)

- Find the position of minimum intrusiveness



Attention  
analysis



# Reduce Intrusiveness-1

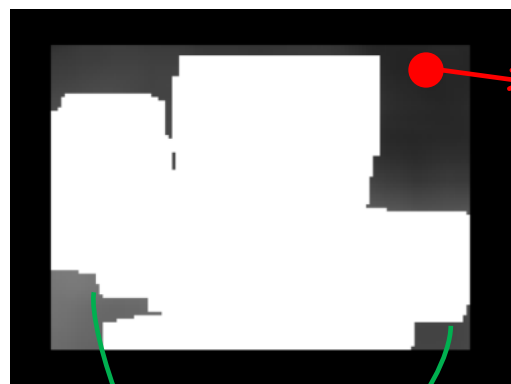
- Find the position of minimum intrusiveness



Attention  
analysis



Color  
distance



Least  
intrusive  
position

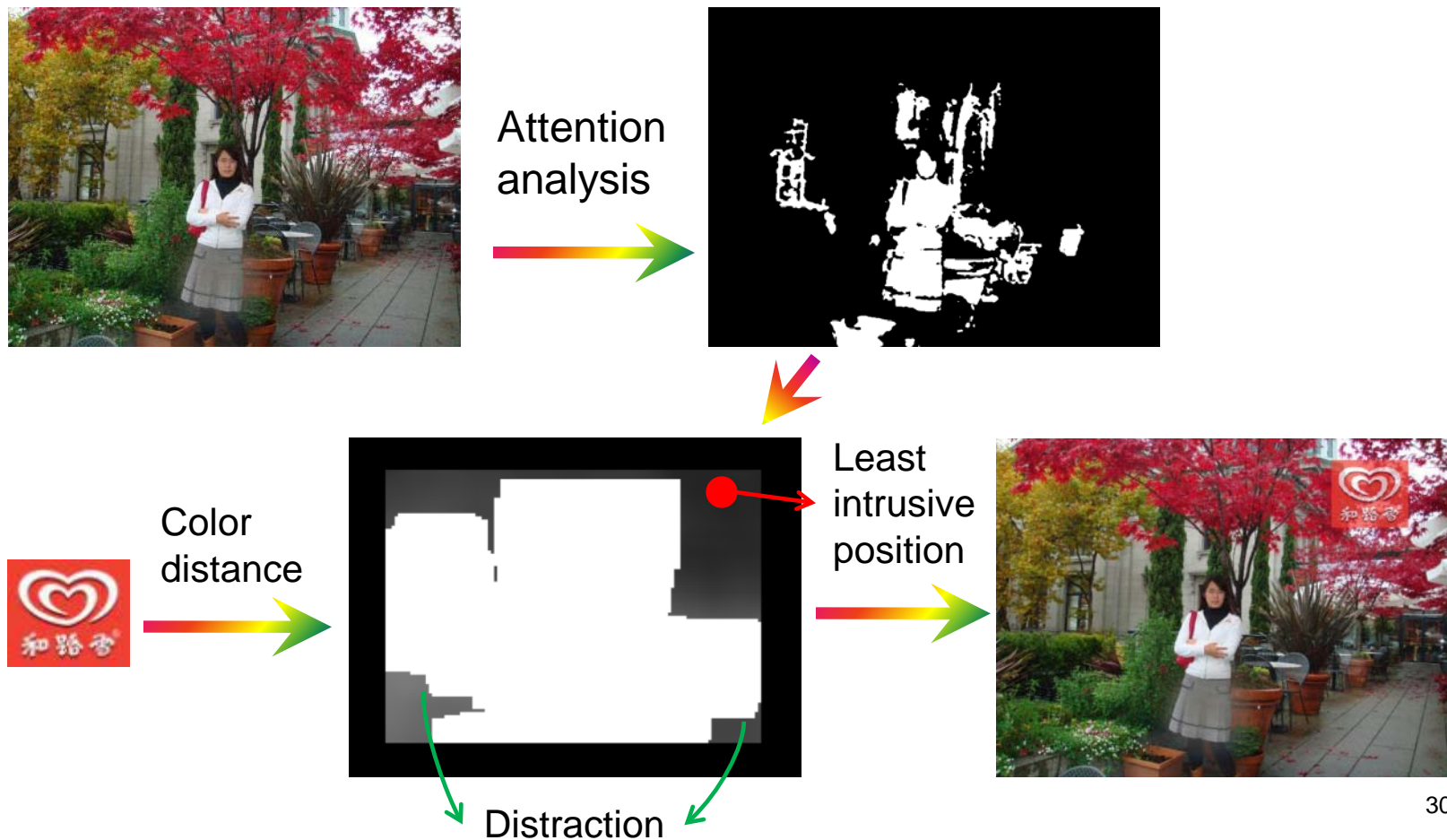


Distraction



# Reduce Intrusiveness-(1)
















- Find the position of minimum intrusiveness





# Reduce Intrusiveness-(2)

- Find the match of minimum intrusiveness

			
			
	0.1015	0.5106	0.2402
			
	0.1056	0.0060	0.2262
			
	0.1035	0.0248	0.1065



# Reduce Intrusiveness-(2)

- Find the match of minimum intrusiveness

	0.1015	0.5106	0.2402
	0.1056	0.0060	0.2262
	0.1035	0.0248	0.1065

			0.2140
			0.3525
			0.7227
			0.8403
			0.3706
			0.3497





# Reduce Intrusiveness-(2)

- Find the match of minimum intrusiveness

	0.1015	0.5106	0.2402
	0.1056	0.0060	0.2262
	0.1035	0.0248	0.1065

			0.2140
			0.3525
			0.7227
			0.8403
			0.3706
			0.3497



# Reduce Intrusiveness-(2)

minimum intrusiveness



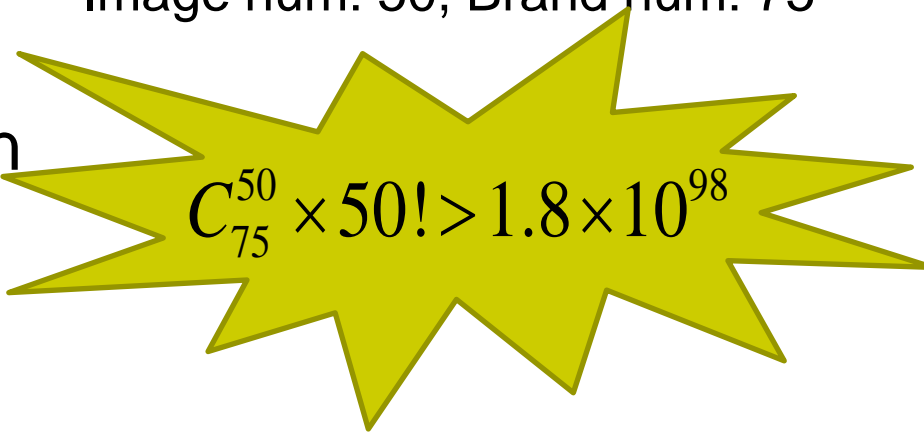


# Reduce Intrusiveness-(3)

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- Problem
  - Combinatorial Explosion

Image num: 50, Brand num: 75


$$C_{75}^{50} \times 50! > 1.8 \times 10^{98}$$

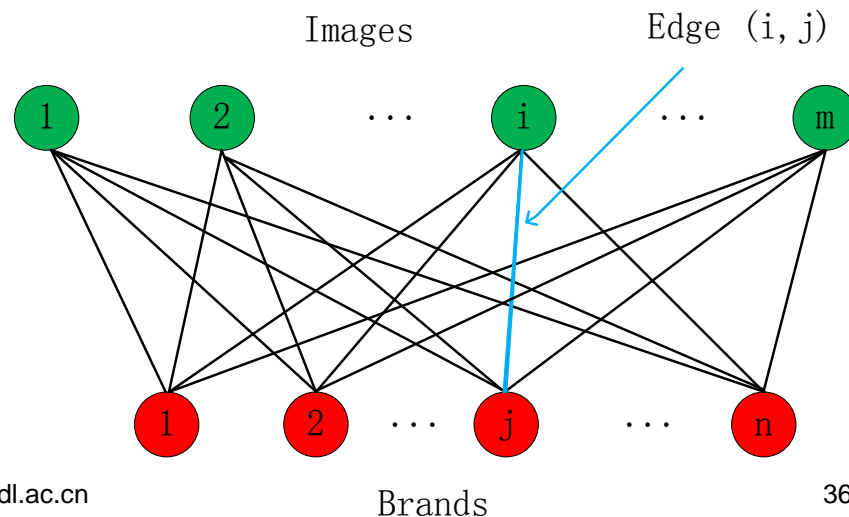
# Reduce Intrusiveness-(3)

Image num: 50, Brand num: 75

- Problem
  - Combinatorial Explosion
- Modeling
  - Bipartite graph

$$C_{75}^{50} \times 50! > 1.8 \times 10^{98}$$

$$\min_{\{(x_i, y_i)\}} \sum_i Intr(x_i, y_i)$$



# Reduce Intrusiveness-(3)

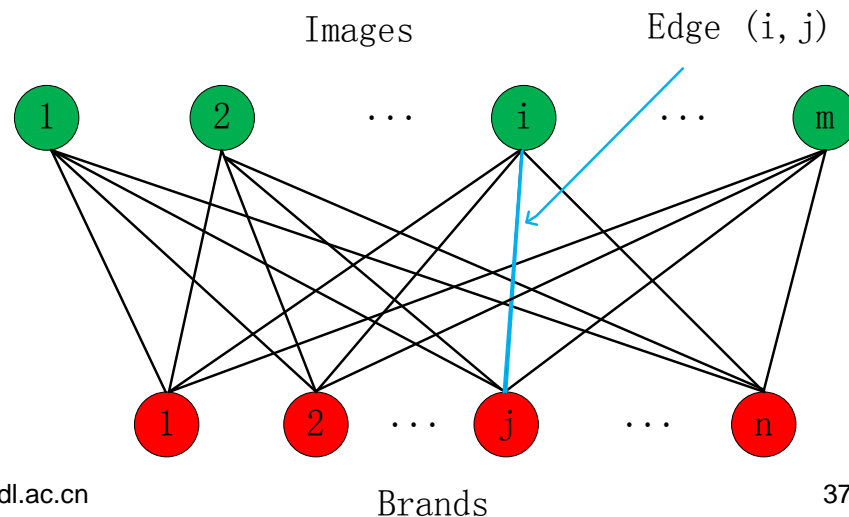
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$$\min_{\{(x_i, y_i)\}} \sum_i Intr(x_i, y_i)$$

- Solution
  - Hungarian algorithm





# Experimental Result-(1)

- Comparison with the random results
  - The ratio of intrusive result is reduced

	1	2	3	4	5	6	Average
Random result	18%	10%	8%	26%	14%	36%	19%
Optimized result	12%	10%	10%	6%	6%	14%	10%



# Experimental Result-(1)

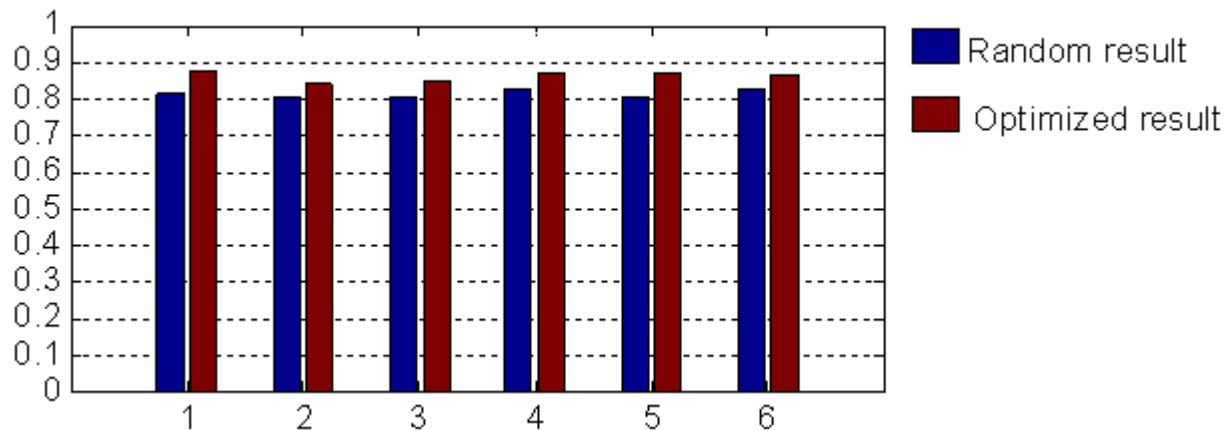
- Comparison with the random results
  - The ratio of intrusive result is reduced
  - The ratio of ROI interference is reduced

	1	2	3	4	5	6	Average
Random result	14%	8%	4%	16%	2%	2%	8%
Optimized result	0%	6%	8%	0%	2%	4%	4%



# Experimental Result-(1)

- Comparison with the random results
  - The ratio of intrusive result is reduced
  - The ratio of ROI interference is reduced
  - The average consistency is increased







# Experimental Result-(2)

- Examples





# Experimental Result-(3)

- Extension





# Conclusion

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- Intrusiveness is measured from the viewpoint of visual attention
  - ROI interference
  - Distraction
- Intrusiveness is minimized through choosing of insertion position
  - Visual attention
  - Color consistency
- Inserting advertisements into albums

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# Thanks!

## Q&A?