Psych 221 Final Project
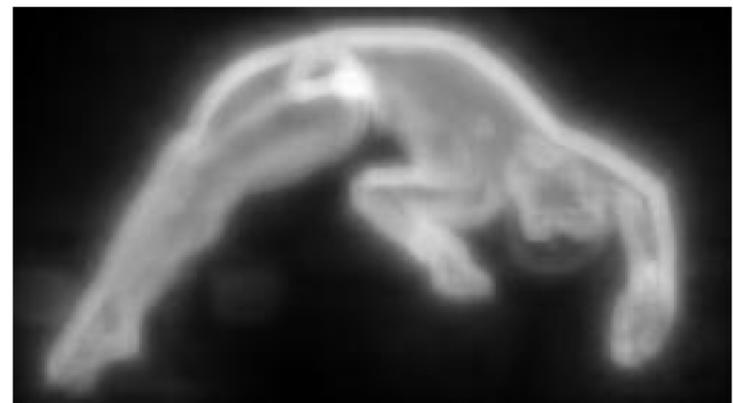# Saliency Detection

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Motivation

Image courtesy of Goferman

Motivation

- Image segmentation
- Object recognition
- Image retargeting

Image courtesy of Goferman

Psychological evidence

- Local low-level consideration.
  - Areas that have distinct colors or pattern should obtain high saliency.
- Global consideration.
  - Frequently occurring features should be suppressed.
- Visual organization rule.
  - The salient pixels should be grouped together, and not spread all over the image.
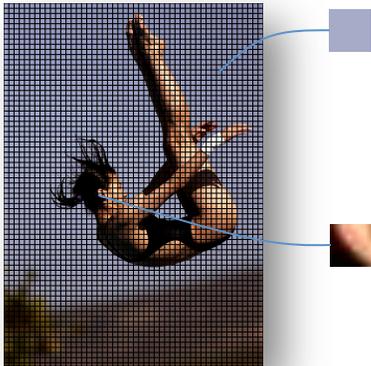
Find salient patches

- Convert RGB image to CIE L*a*b* color space.
- Divide image into patches, each patch is 8x8.
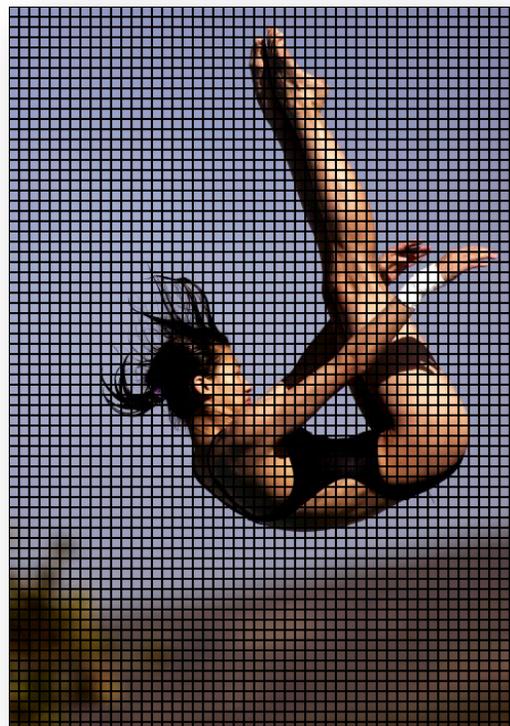
Find salient patches

- Compute the color distance between p_i, p_j. Normalize to the range [0,1].

$$d_{color}(p_i, p_j) = \alpha \sum_{u=0}^{7} \sum_{v=0}^{7} |p_i(u,v) - p_j(u,v)|$$

- Compute the positional distance between p_i, p_j. Normalized by the larger image dimension.

Find salient patches

- Compute DCT for each 8x8 patch.
- Use the quantization table in JPEG compression to compute the weighted distance.
- $d_{freq}(p_i, p_j) = \sum_{u=0}^{7} \sum_{v=0}^{7} \frac{1}{q(u,v)} |P_i(u,v) - P_j(u,v)|$

16	11	12	14	12	10	16	14
13	14	18	17	16	19	24	40
26	24	22	22	24	49	35	37
29	40	58	51	61	60	57	51
56	55	64	72	92	78	64	68
87	69	55	56	80	109	81	87
95	98	103	104	103	62	77	113
121	112	100	120	92	101	103	99

Saliency score

- For each patch, compute the distance to other patches.

$$d(p_i, p_j) = \frac{c_1 d_{color}(p_i, p_j) d_{freq}(p_i, p_j)}{1 + c_2 d_{position}(p_i, p_j)}$$
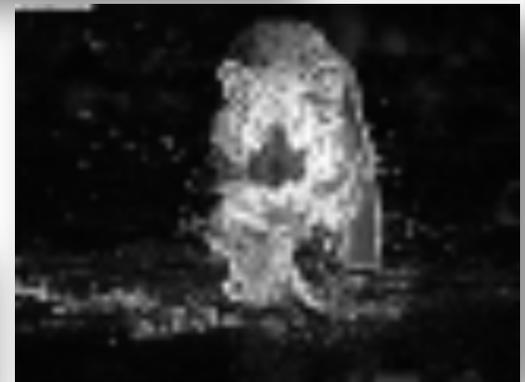
- Select K smallest distances and compute the saliency score.

$$S_i = 1 - \exp\left(-\frac{1}{K}\sum_{k=1}^{K} d(p_i, p_j)\right)$$

Saliency map

- Set each patch to be proportional to its saliency score.

- Use Gaussian kernel to smooth the saliency map.

Experiment results

Conclusion and future work

- Multi-scale detection.
- Complex scene.

Q&A

Thank you!