Scene-Consistent Visual Saliency

S&T Campaign: Information Sciences
Sensing and Effecting

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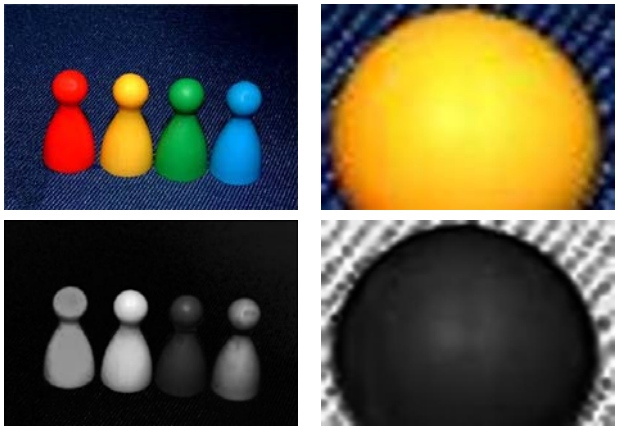
Research Objective

- **Enable intelligent and efficient autonomous visual surveillance.**
- **Specifically: use ideas from computational *visual saliency* to help analyze and guide collection of surveillance imagery with a pan-tilt-zoom (PTZ) camera.**

Objective: camera-equipped robot efficiently surveys complex environment

Challenges

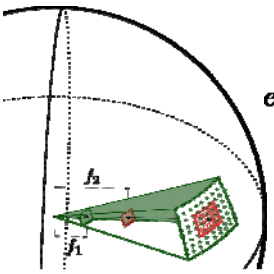
- **Wide-area surveillance via PTZ camera requires multiple images; computing saliency maps independently doesn't guarantee a geometrically-*consistent* measure of visual saliency, i.e., one for which saliency values agree in areas of overlap.**



Independent processing fails to produce a consistent *measure of bottom-up visual saliency*

ARL Facilities and Capabilities Available to Support Collaborative Research

- **Hardware: multiple pan-tilt-zoom cameras**
- **Facilities: access to unique, Army-relevant environments for data collection**
  - **E.g., unique dataset (3616 images spanning 18 scenes) with human annotation.**
- **Expertise: developed *ray saliency* method[1].**
  - **Modifies classical computational visual saliency to explicitly enforce consistency for multi-image data.**
  - **Incorporates PTZ imaging geometry with existing, graph-theoretic notion of visual saliency.**



$$e_{k,k'} = s_\sigma(\mathbf{X}_k, \mathbf{X}_{k'}) d(\mathbf{f}_k, \mathbf{f}_{k'})$$

$$\mu_k = \frac{\sum_{k' \in \nu} e_{k,k'}}{\sum_{k'' \in \nu} s_\sigma(\mathbf{X}, \mathbf{X}_{k''})}$$

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- **Planned extensions of existing work to:**
  - **top-down cues.**
  - **translating camera.**
  - **saliency-driven camera control.**
- **Seeking expertise in visual saliency, camera geometry, and/or camera control**

Challenging, Army-relevant urban environment

Publications

1. G. Warnell, P. David, R. Chellappa. "Ray Saliency: Bottom-up Visual Saliency for a Rotating and Zooming Camera." International Journal of Computer Vision. 2015.