Spatiotemporal Saliency Model of Human Attention in Video Sequences

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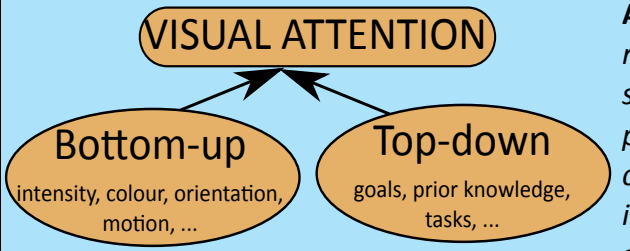
V&G

Visual attention

- brain receives from the environment huge amount of sensorial data
- **attention** provides mechanisms of selecting important information
- **saliency** = stimulus standing out relatively from its neighbours
- **saliency map** = topographic representation of visual saliency



Applications:
robotics, surveillance systems, image processing, video compression, medical imaging, advertisement, software design, ...

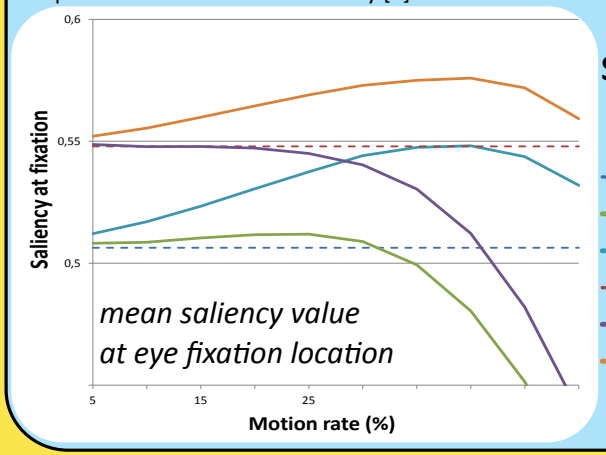
Results

Spatial model

Toronto dataset

Model	Itti [1]	Itti2 [1]*	GBVS [2]	AIM [3]	Judd [4]	HFT [5]	CAS [6]	***SPX***
sAUC	.61	.66	.64	.68	.69	.68	.69	***.65***

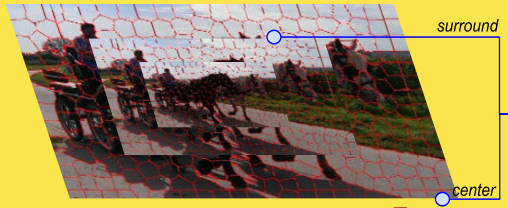
[1] ITTI, L., et al. (1998). A model of saliency-based visual attention for rapid scene analysis.
[2] HAREL, J., et al. (2006). Graph-based visual saliency.
[3] BRUCE, N., TSOTSOS, J. (2005). Saliency based on information maximization.
[4] JUDD, T., et al. (2009). Learning to predict where humans look
[5] LI, J., et al. (2013). Visual saliency based on scale-space analysis in the frequency domain.
[6] GOFERMAN, S., et al. (2012). Context-aware saliency detection.
* improved version of Itti´s model by [2]

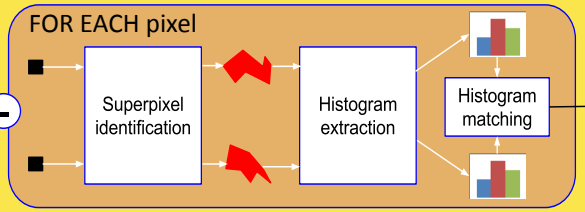


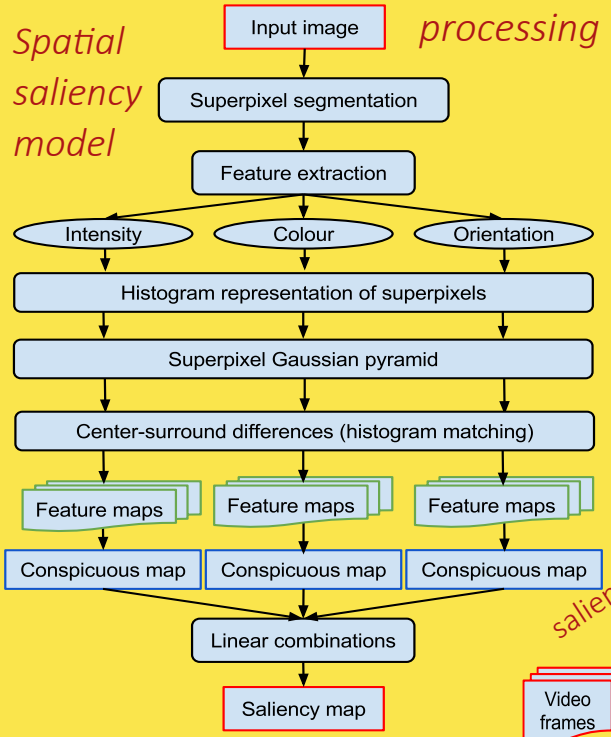
Spatiotemporal model

Private videodataset

- Itti (spatial)
- Itti (spatiotemporal)
- Itti (spatiotemporal + innovation)
- SPX (spatial)
- SPX (spatiotemporal)
- SPX (spatiotemporal + innovation)

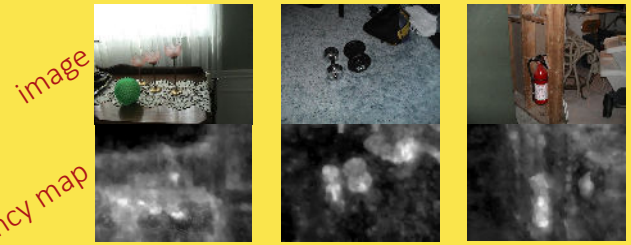


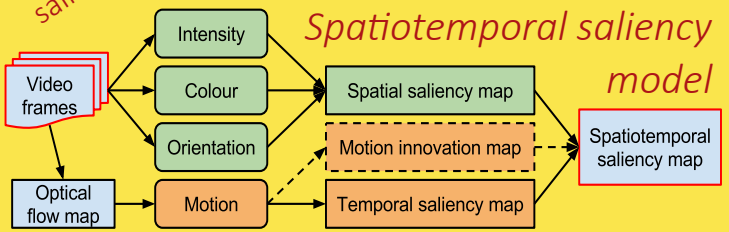




Superpixel-based saliency model

- hierarchical bottom-up saliency method based on Itti´s model [1]
- superpixel-based approach reflecting object´s contours
- center-surround differences implemented as difference of Gaussians per superpixel (SPX)
- Gaussian layers contain SPXs represented by histograms





Feature maps

1. intensity
- grayscale image
- SPX comparison: correlation

2. colour
- opponent colour theory
- SPX comparison: mean colour

3. orientation
- oriented gradients
- SPX comparison: correlation

Motion saliency

- processing of dense optical flow maps
- moving object -> local optical flow

1. temporal saliency map
- superpixel-based approach
- histogram of flow orientations and magnitudes

2. motion innovation map
- temporal changes in a video sequence
- motion memory