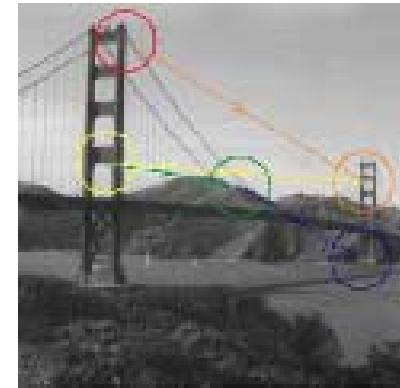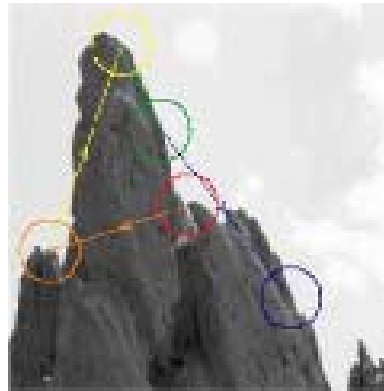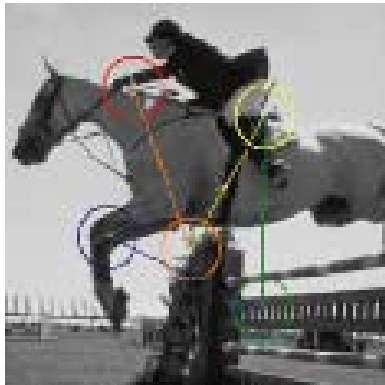# Fast Extraction of Feature Salience Maps for Rapid Video Data Analysis

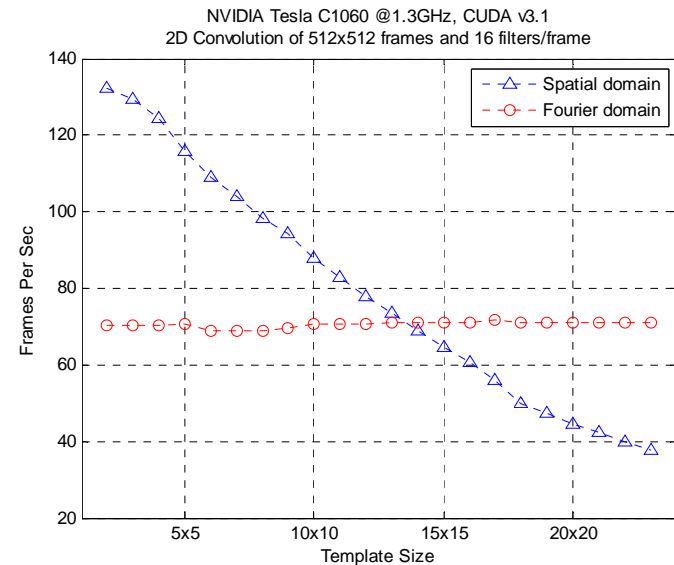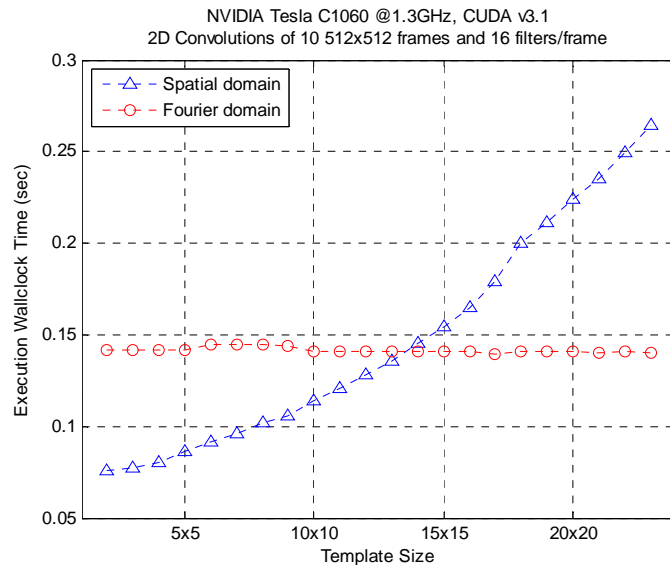*Nikos P. Pitsianis* and Xiaobai Sun

Feature Salience Maps (FSMs)

- FSMs are used in
  - separation or integration
  - automatic or assisted visual search tasks
  - target indication, object recognition, tracking
- Salient information in multiple feature dimensions
  - color, edge orientation, shape, texture, motion
  - selective tuning, feedback, attentional or intentional guidance
- High volume and rate of video data, frame by frame
- Involves many filtering steps at multiple spatial scales

MUNDHENK, T. N., ITTI, L. Computational modeling and exploration of contour integration for visual saliency. Biological Cybernetics (2005).

Processing of feature maps on GPU

NVIDIA Tesla C1060 @1.3GHz, CUDA v3.1
2D Convolutions of 10 512x512 frames and 16 filters/frame

NVIDIA Tesla C1060 @1.3GHz, CUDA v3.1
2D Convolution of 512x512 frames and 16 filters/frame

- Direct domain
  - Filter-centric
  - Image-centric

- Fourier domain
  - Based on the convolution theorem

- Using CUDA SDK 3.1
  - NVIDIA Tesla C1060
    - 240 processing cores @ 1.3GHz
    - 4GB or GDDR3
  - CUFFT CUDA FFT library
  - Asynchronous I/O and Streaming

Discussion

- The extraction and use of salient information from static or dynamic images are recent and active research topics
- The computation based on an extraction model serves two purposes
  - Test and validate the underlying neurobiological model for certain visual function in the visual system of the primate brain
  - Exploit the new understanding and model(s) for developing and improving artificial vision systems.
- Challenges :
  - generation of motion features, which are much more computation intensive
  - visual tasks at the higher levels
    - segmentation, object recognition, tracking of moving targets.
    - data representation at higher levels, sparse and irregular, but still structured
  - Efficiency of high-level processing steps on GPUs