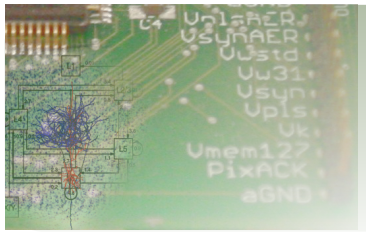

Neuromorphic Models of Selective Attention for Controlling Actuated Silicon Retinas

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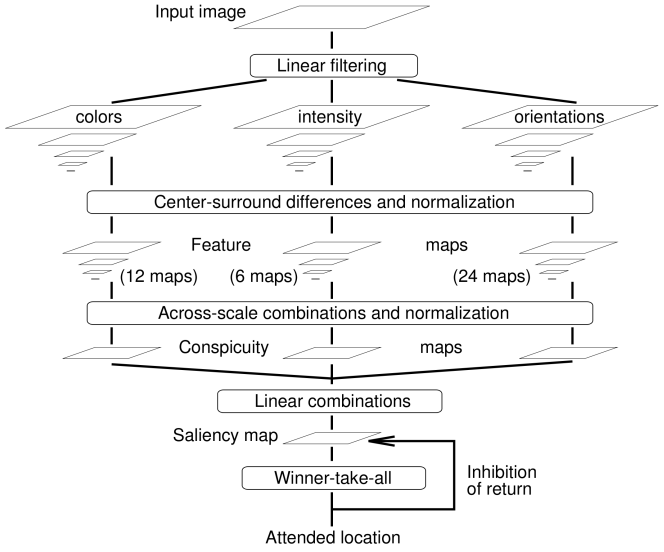
Summary

We present a custom multi-chip system, comprising hybrid analog/digital VLSI devices, which implements an active vision system driven by a neuromorphic model of selective attention. The selective attention model is implemented by a VLSI device comprising biologically realistic models of neurons and synapses, embedded in a Winner-Take-All (WTA) network, which selects the input region with highest saliency.

The input to this chip is provided by a real-time event-based silicon retina, and its output is used to determine the region of interest in the visual field, and orient the retina in a way to center the region.

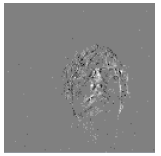
Model of Attention



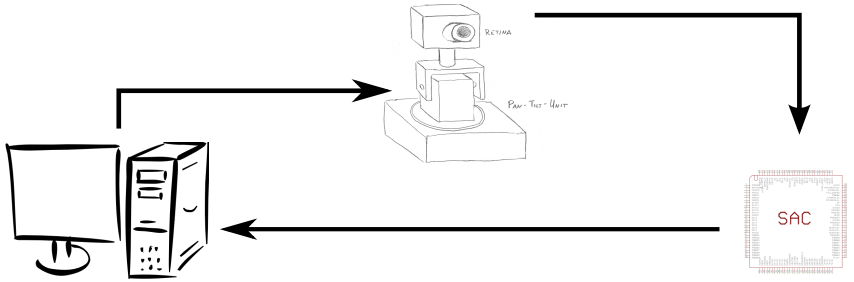
Our setup is based on the theoretical model of saliency-based visual attention published by Itti, Koch and Niebur in 1998. At the moment we consider the intensity pathway of the image processing though.

Setup

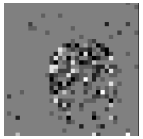
Our setup consists of a 128x128 pixel Dynamic Vision Sensor (retina) that responds to temporal contrast. Its output spikes are fed into a Selective Attention Chip (SAC).



The sensor is mounted on a pan tilt unit.



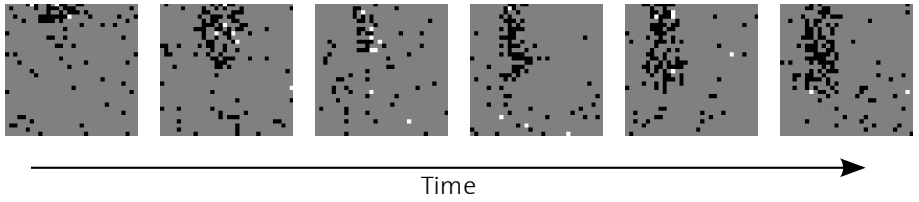
By counting the SAC's output spikes for five different regions (left, top, right, bottom, center) the computer decides in which direction the pan tilt unit has to move to focus the region of interest.



The SAC consists of a 32x32 pixel array. It chooses the region with highest saliency. Therefore it spikes at the region with highest input stimulus.

In the plot, black dots represents the input stimulus whereas the SAC output is represented by white dots.

Results



Setup is detecting the tip of a pen and moves it to focus.