# Live Demonstration: real time objects tracking using a bio-inspired processing cascade architecture

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***Abstract*—This demonstration shows how a new bio-inspired processing cascade architecture is used for simultaneous objects tracking.**

This demonstration is associated with *Event-based Neuromorphic Systems* track.

## I. Demonstration Setup

The demonstration consists of two USB-AER boards [1] (Fig. 1 shows a USB-AER board's picture); one is configured to process the event based visual information provided by an asynchronous temporal contrast silicon retina [2]; and the other one is configured as an AER monitor in order to visualize the retina output. The first USB-AER board is configured to track several moving objects in the scene. Concretely, the live stimulus consists of four objects moving at different velocities and trajectories. Fig. 2 shows the demonstration's block diagram.

Objects tracking results and the retina output are downloaded to a PC and drawn together on the screen.

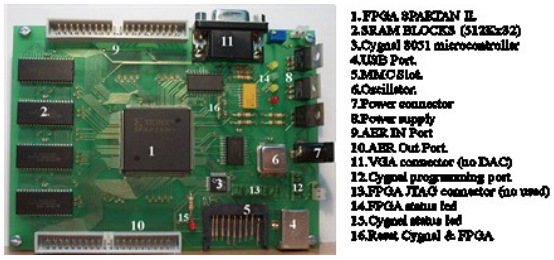


Figure 1. USB-AER Board

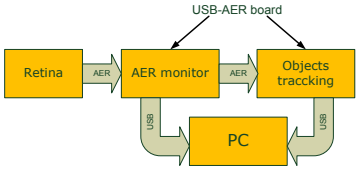


Figure 2. Demonstration's block diagram

Fig. 3 a) shows the stimulus: a cross, a circle, a triangle and a square moving at different velocities and trajectories; b) shows a 2D histogram of the retina output; and c) shows the system's output fused with the retina output, where arrows represent the apparent object's velocities on the *image's plan* (for better visualization, retina output is drawn in negative color).

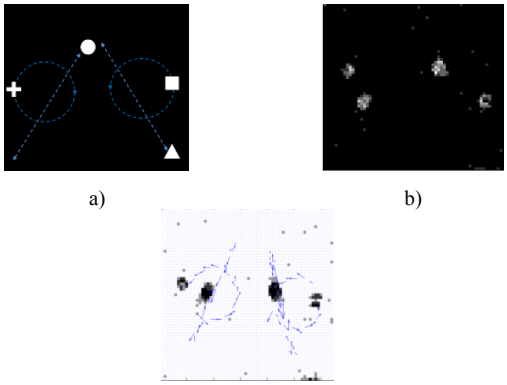


Figure 3. Stimulus, retina output and system result: a) shows the stimulus composed by 4 objects (a cross, a circle, a triangle and a square) moving at the different velocities and trajectories; b) shows a 64x64snapshot subsampled silicon retina output; and c) system's output fused with silicon retina output where arrows respresent the apparent object's velocity on the *image's plane.*

The systems can track several objects simultaneous and estimate their velocities with a very short respond time (only 20 ms). Velocity estimation has some limitations mainly when the object's velocity is less the respond time, but this can be improved by increasing the system respond time.

## II. Visitors Experience

Visitors can interact with the system by changing the number of the objects and their velocities and trajectories. They can learn about neuro-inspired and event-driven systems.

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## References

[1] F. Gómez-Rodríguez, R. Paz, A. Linares-Barranco, M. Rivas, L. Miró, G. Jiménez, A. Civit. "AER tools for Communications and Debugging". *Proc. IEEE ISCAS06.* Kos, Greece, May 2006.

[2] Lichtsteiner, Delbruck, Posch: "A 128x128 120 dB 15 µs Latency Asynchronous Temporal Contrast Vision Sensor". , Solid-State Circuits, IEEE Journal of, ISSN 0018-9200; vol.43, no.2, Feb. 2008, p. 566-576