Event-Based Vision with Dynamic Vision Sensors

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Problem

Computer vision is computationally expensive because it is based on processing redundant frame-based information at limited frame rate. Identical exposure time limits dynamic range.

Silicon retinas with activity-driven, event-based output reduce computational cost, reduce reaction time, and improve operation under variable lighting.

Goals

New generations of event-based vision sensors. Efficient event-based algorithms and software. Partners in industry and academia.

Application areas

- Robotics
- Navigation
- Surveillance
- Particle tracking
- Algorithm research

Algorithms and Applications

jAER and DVS

jAER is an open-source project on SourceForge for real-time processing with event-based visual and auditory sensors.

jaer.wiki.sourceforge.net

Main Challenges

- Transistor mismatch
- Asynchronous design
- Low fill factor and large pixel size
- Novel event-driven algorithms

The activity-driven address-event retina output asynchronously reports only active pixels. For example, the rotating black dot produces only the spiral of events in space-time. The cost of processing these events is tiny compared to processing the equivalent frames and the information is available in less than a millisecond.

Principles of DVS operation

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Dynamic vision sensor silicon retinas

The DVS128 Camera

The eDVS embedded camera

The DVS128 Camera

The eDVS embedded camera

The DVS128 Camera

The DVS128 Camera

The eDVS embedded camera

Latest test chip

The DVS128 Camera

The eDVS embedded camera

The DVS128 Camera

The eDVS embedded camera

Vision sensors with unique advantages for low latency, dynamic range, and sparse, informative output.

Institute of neuroinformatics

ETH

University of Zürich

SeeBetter