Prophesee's Event-Based Sensor and AI Solutions Enabled by AMD Kria SOMs

New AI enhanced Vision-Sensing Solution to Capture "Scene" Changes in a Computationally Efficient Manner for Industrial and Automotive Applications

PARTNER

PROPHESEE METAVISION TECHNOLOGIES

INDUSTRY

Industrial / Automotive

CHALLENGES

Embedded vision systems are replacing traditional PC and network/cloud-based cameras for more power and autonomy at the edge. Data bandwidth and latency are of major concern combined with the need to reduce system power.

SOLUTION

Prophesee recently announced that its event-based Metavision HD sensor and AI solutions are now available for use with the AMD Kria™ KV260 Vision AI Starter Kit, creating a powerful and efficient combination to accelerate the development of advanced edge machine-vision applications.

RESULTS

For machine-vision applications, Prophesee's event-based vision solution, powered by AMD, offers unique advantages thanks to its low data consumption, which can result in lower energy consumption, less memory use, and faster response times vs. frame-based cameras.

Conventional imaging uses a frame-based approach, where the pixels in a sensor measure light at pre-defined points and report their values. This approach works well for humans, but it's not ideal for machine-vision applications. One reason is that a conventional camera applies a common frame rate to the entire scene. This means moving elements are likely to be under-sampled while stationary ones are needlessly replicated. Machine-vision systems, therefore, are burdened with processing large amounts of useless data, using expensive, power-hungry processors, high-bandwidth communications links, and memory, to no useful effect. This approach works well for some applications, but may not be suitable for others that need to understand scenes in real time, or are in environments with limited power, bandwidth, and computing resources.

CHALLENGE

Event-based cameras can outperform their frame-based counterparts in many applications. A frame-based camera outputs sequential frames of data and its speed is expressed in frames per second. Frame-based cameras also require an exposure period to allow the pixels to accumulate enough photons to produce a useful signal above the various electrical noise components. As a result, frame-based cameras can suffer from high latency with blurred edges on fast moving objects in the scene, and with performance limitations in low light conditions or high dynamic range scenes. In high-speed applications, they exhibit a high-power consumption and/or require high intensity illumination to be provided, which, for many computer vision applications, represents significant challenges that are hard to overcome.

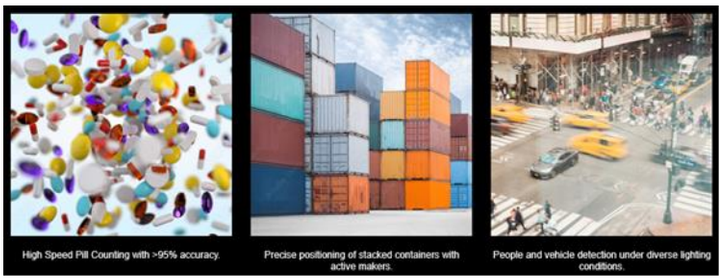
Conversely, event-based cameras only output the pixels that have detected contrast changes. This approach significantly reduces the amount of redundant data transmitted, therefore saving processing power, data transmission bandwidth, memory, and energy. Enhanced by AI, these vision-sensing solutions can accelerate development of edge-based applications.

Prophesee's event-based sensors output a time-continuous data stream of events with their respective x and y coordinates on the array, and a unique timestamp at microsecond resolution. This data stream provides a detailed and continuous detection of motion in the field of view vs. inferring it from frame-to-frame processing of a standard sensor's output. Dynamic scenes can be analyzed as spatiotemporal patterns with blur-free edges for measuring trajectories, or velocities of objects.

Each pixel provides information at the rate of change in its field of view, not at an arbitrary, preset, and fixed frame rate. Scenes can be viewed as a sequence of events that form patterns representing the edges, trajectories, or velocities of objects.

"Our event-based vision-sensing solutions can be used in a variety of embedded vision applications," said Gareth Powell, director of product marketing at Prophesee. "One example that we can demonstrate on the Kria platform is container stacking on ships, where we use active markers (LEDs) on a container suspended from a crane to determine the precise positioning of the container in 3D space. Another example could be counting or sorting grains or pills that are rapidly moving in an automated factory," he added. "Our event

sensors can yield a detection accuracy above 99 percent, and can detect about 1,000 defects per second, with sorting machines running at two- to three-times the traditional speed to enable higher throughput and greater sorting accuracies."



Powell said Prophesee's goal is to enable a business for the embedded market (industrial, IoT, defect detection, etc.) where the use of FPGAs is quite common. As a result, the company recently announced that its event-based Metavision HD sensor and AI solutions are now available for use with the AMD Kria™ KV260 Vision AI Starter Kit, creating a powerful and efficient combination to accelerate the development of advanced edge machine-vision and machine learning applications. This kit provides customers a platform to both evaluate and go to production with an industrial-grade solution for target applications such as smart city and machine vision, security cameras, retail analytics, and many others.

SOLUTION

Prophesee chose AMD due to industrial customer demand from clients who already use AMD FPGAs, adaptive SoCs, and SOMs (system-on-modules), such as the Kria K26, and were asking for drivers to enable event-based cameras to operate with the Kria SOMs. The KV260 Vision AI Starter Kit features a non-production version of the K26 SOM and is built for advanced vision application development without requiring complex hardware design knowledge or FPGA programming skills. Kria SOMs for AI edge applications provide production-ready, energy-efficient adaptive SoCs with enough I/O to speed up vision and robotics tasks at an affordable price. Combined with Prophesee's event-based vision technology, developers can leverage the high-speed, sparse data, superior tolerance to complex environmental lighting low latency and low power capabilities of the Metavision platform to create more efficient applications, compared to traditional frame-based imaging approaches. Prophesee has developed a comprehensive, event-based vision software suite with many use case examples, 95 algorithms, 67 code examples in addition to optimization tools, ML data sets, and an extensive open-source community.

Machine-learning acceleration software companies, such as LogicTronix, have created applications for detecting and tracking vehicles and people. This application uses Prophesee's event-based vision technology alongside the AMD Kria KV260 Vision AI Starter Kit. It is set to be released soon on the Kria App Store.

Potential Traffic monitoring and Automotive Use Cases

Today, most ITS and automotive ADAS systems use multiple cameras to detect vehicles and pedestrians and determine their distance, shape, and velocity. Prophesee's event-based sensors enable dynamic scenes to be analyzed as a highly resolved temporal sequence of events at very high speed and low latency with low computational cost to make faster and safer decisions.

RESULT

"For machine-vision applications, Prophesee's event-based vision offers unique advantages that translates into more efficient energy consumption, less computer and memory usage, and faster response times. This also provides a convenient solution to the increasing demand for robust embedded vision with powerful AI features that require reduced memory and cloud usage," Powell said. "The Metavision Starter Kit for the AMD Kria KV260 allows developers to support new and more powerful vision use cases using Prophesee's innovative event-based vision approach," he added.

WANT TO LEARN MORE?

About AMD Kria SOMs

About Prophesee

About PROPHESEE

Prophesee is the inventor of neuromorphic vision systems. Inspired by human vision, Prophesee's technology uses a patented sensor design and AI algorithms that mimic the eye and brain to reveal what was invisible until now using standard frame-based technology. Prophesee's computer vision systems open new potential in areas such as autonomous vehicles, industrial automation, IoT, mobile and AR/VR. Prophesee's technology is fundamentally different from traditional image sensors, introducing a new computer vision category: event-based vision. For more information: https://www.prophesee.ai/

About AMD

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