Allied Vision

// ALECS - THE ALL-IN-ONE MACHINE VISION SOLUTION

Image Acquisition and Processing Options with Alecs

eVision
Image Analysis Software Tools

NVIDIA PREFERRED PARTNER

The Power of Possibilities

Machine Vision the smarter and faster way

The adoption of Machine Vision technologies has become a critical component in driving business success and competitiveness. As companies strive to automate and optimize their processes, the growing complexity of computer vision tasks, the need for real-time processing, and the demand for edge-based solutions have driven the adoption of more powerful and specialized hardware, such as GPUs and smart cameras. The rise of Deep Learning techniques has enabled the development of more accurate and robust computer vision models, but also introduced new challenges related to data quality, model training, and deployment.

System designer and developers must navigate these challenges and trends to create effective and efficient applications. This paper aims to provide guidance on how to effectively develop customized and powerful Machine Vision solutions that meet their specific needs utilizing Allied Vision's open smart camera Alecs together with eVision libraries.

The combination of Alecs and Allied Vision´s eVision libraries offers a comprehensive solution that addresses various challenges of developing Machine Vision solutions, providing a powerful and flexible platform for developing customized and powerful Machine Vision applications.

Challenges in Developing Machine Vision Solutions

Developing Machine Vision solutions is a complex task that poses several challenges to developers. These challenges include:

// **Time pressure:**
The time pressure to deliver a working solution can be significant, and developers must balance the need for accuracy and reliability with the need for speed. This can be particularly challenging when working with complex computer vision tasks, such as object detection or image classification, which require significant development and testing time.

// **Integration of different tools:**
Machine Vision applications often require the integration of multiple tools and technologies to perform different tasks, such as defect detection, code reading, and decision-making. The different tools and technologies must work seamlessly together to achieve the desired outcome. For example, developers may need to integrate a computer vision library for image processing with a machine learning framework for classification and a database for storing and retrieving data.

// **Hardware selection:**
Developers must carefully evaluate a wide range of options available, including cameras, processors, and memory, to select the hardware that best meets the needs of their application. This can be a time-consuming and challenging process, particularly for developers who are not familiar with the different hardware options.

// **Scalability in prototyping:**
Changing requirements and increasing demands often characterize engineering and development processes. System designs need to be scalable and flexible, allowing developers to easily add new features and functionality as needed. This can be a significant challenge, particularly when working with complex computer vision tasks that require significant computational resources.

// **Image processing knowledge:**
Image processing is a critical component of Machine Vision applications. Developers must have a strong understanding of image processing techniques and algorithms to develop effective solutions. However, many developers lack the necessary knowledge and expertise in image processing, which can make it difficult to develop accurate and reliable Machine Vision applications.

// **Computational power:**
Machine Vision applications require significant computational power to perform complex computer vision tasks, such as object detection and image classification. Developers must ensure that their applications have access to sufficient computational resources to perform these tasks in real-time.

Open and smart: the perfect team for developing customized solutions

Allied Vision's Open Smart Cameras Alecs and eVision libraries are designed to address challenges of developing Machine Vision solutions by providing a powerful and flexible platform for developing customized and powerful Machine Vision applications.

Powerful Camera Platform

Alecs combines the well-known Alvium camera platform with the powerful NVIDIA Jetson Orin System on Module (Jetson Orin Nano 8GB and Jetson Orin NX 16GB SoM). With an open platform design, Alecs allows for seamless integration with third-party software and customization to specific needs.

With the Alvium camera at its core, Alecs offers a wide range of integrated sensors including SWIR sensors and a comprehensive feature set for image processing. NVIDIAs powerful Orin NX 16, with Alecs enabling power modes of up to 25W, allow complex AI algorithms and high-performance processing. In the 25W power mode, additional computing resources of the NVIDIA Jetson Orin platform are activated, including dedicated accelerators such as the Deep Learning Accelerator (DLA) and the Programmable Vision Accelerator (PVA), enabling efficient offloading of AI and vision tasks and optimal utilization of the integrated hardware. The Alecs system design supports sustained operation at these performance levels without thermal throttling limitations.

The industrial-grade hardware, featuring a durable housing with IP67 protection and heat dissipation, withstands shock, vibrations, and harsh conditions, making it suitable for various industrial applications. Flexibility in application development allows users to tailor the camera to their specific needs, while on-board image processing and optimization features guarantee high image quality.

Available with Jetson Orin NX 16GB or Jetson Orin Nano 8GB

The Board Support Package, based on Vimba X, along with an integrated recovery mode, ensures the camera remains in a safe state, providing an additional layer of technical reliability. Furthermore, compatibility with eVision Image analysis libraries enhances the camera's integration capabilities, making it a versatile and reliable choice for developers.

Innovative Machine Vision Software

eVision libraries are a versatile and powerful solution for machine vision inspection applications, offering hard-ware-independent image processing and analysis. This flexibility allows them to seamlessly integrate with various image sources, including frame grabbers, GigE Vision, and USB3 Vision cameras, ensuring compatibility across different systems. The libraries support cutting-edge advancements such as Deep Learning and 3D vision, which are essential for modern machine vision tasks. They provide precise sub-pixel measurement and calibration, crucial for achieving high accuracy in inspections.

Available in 64-bit versions for both Windows and Linux, eVision libraries cater to a wide range of operating systems, including Linux on ARMv8-A architectures. They support multiple programming languages, including C++, Python, and the .NET framework, making them accessible to a diverse community of developers. Designed to be user-friendly, eVision libraries are easy to learn and use, yet robust and flexible, making them a reliable choice for developers seeking a power- ful tool for their machine vision projects.

eVision
Image Analysis Software Tools

eVision - Image analysis and software tools

Image Acquisition and Processing with Alecs

The open smart camera Alecs and the Machine Vision Software eVision libraries, offer a powerful combination of Machine Vision camera, computational power, and pre-installed libraries. Alecs provides the advanced hardware and Linux-based foundation, giving developers complete freedom to develop and deploy their own applications. The indispensable basis for nearly every machine vision application is the image, or image acquisition. Running analyses and performing tasks always require an image - at the right moment, in the appropriate resolution, and with the required quality. To unlock the full potential of Alecs, it is essential to understand the various options for image acquisition and processing.

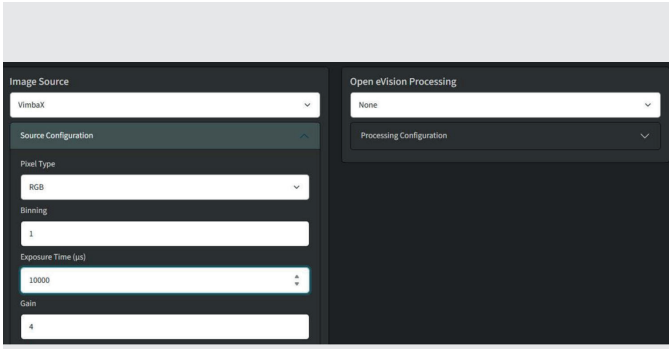
After connecting Alecs to the network and powering it up, there are different ways possible to start working with it. From getting the first image and testing the features of the eVision libraries up to programming directly on Alecs via a coding tool.

Option 1: GUI and eVision Demonstrator

A straightforward way to get started with Alecs is by accessing the pre-installed eVision Web Demonstrator through a web browser. Simply open http://192.168.1.10:8080 in the browser of any PC connected to the same network as Alecs. Upon initial connection, the Web Demonstrator will launch automatically, with VimbaX selected as the image source and „None“ as the eVision processing option. This option requires no license, allowing developers to immediately adjust settings such as pixel format, binning, exposure time, gain, color balance, and image flipping.

For more advanced image processing, eVision offers a range of capabilities, including matching and measurement libraries, code and text reading libraries (text, barcode, QR and matrix code reading), Deep Learning based classification, segmentation, localisation and advanced code reading libaries, 3D libraries as well as other general purpose libraries (Image processing and color reading) and applicative processing library.

Alecs comes with a 30-day trial license for all eVision libraries, which begins when developers first use eVision processing beyond the „None“ setting or utilize the eVision API directly. This trial period gives developers time to evaluate the libraries they deem useful for their specific application.



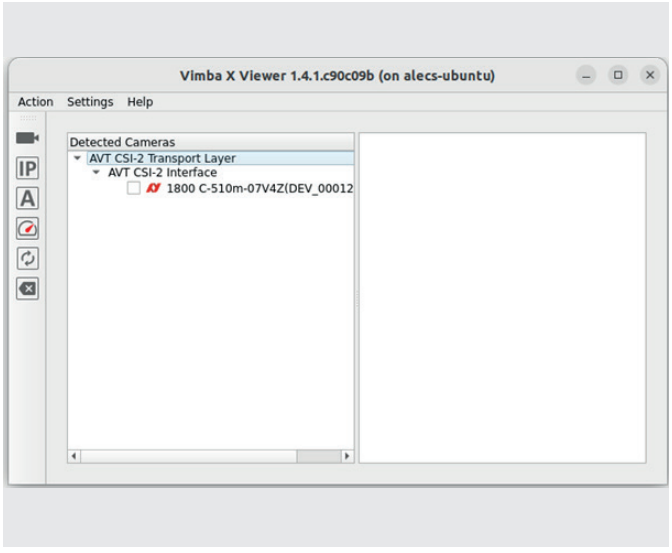
eVision Web Demonstrator

Option 2: Vimba X Viewer @ Alecs

Part of the Board Support Package (BSP) installed on Alecs is Allied Vision‘s Vimba X Viewer. Developers can start this easily by following these steps:

- ☑ On Windows systems, install an SSH client with X support, such as MobaXterm X11 server
- ☑ Set up an SSH (Secure Shell Protocol) connection:
  - IP address: 192.168.1.10
  - User name: alecs
  - Password: alecs
- ☑ Connect to Alecs with ssh -X alecs@192.168.1.10
- ☑ Now open Vimba X Viewer from the file management system

Now developers can work with Vimba X Viewer running on Alecs just like they would on their PC. Start the camera, get images, change settings. Use all the comfort and benefit of Allied Vision‘s Vimba X Viewer.



Vimba X Viewer

Option 3: Stream to VLC Player with our streaming example

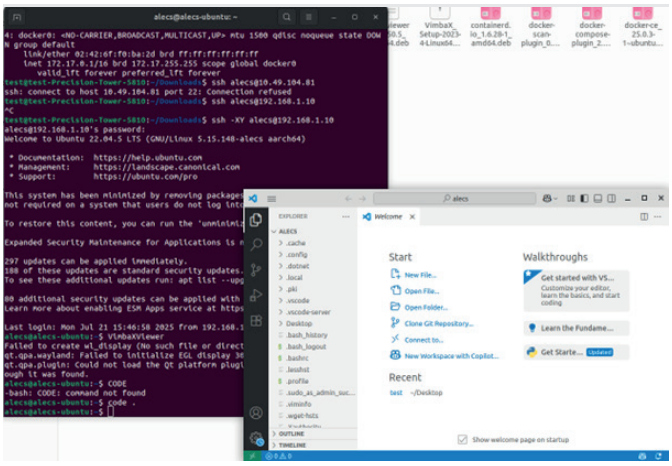
There are some Python examples on Alecs integrated within the file system. One example enables developers to start the camera streaming and receive the data in a video tool like VLC. Starting the example needs slightly more steps that are still easy to be done. They are explained in the user guide, which can be found on the Allied Vision website.

Option 4: Program directly on Alecs with a coding tool

Another way to work with Alecs is to program directly on Alecs and store files on it. Therefore, developers need to configure their coding tool like VS Code studio in remote deployment and connect with Alecs. This possibility is often used by programmers, and Allied Vision's application engineers are happy to help with setting this up.

Teamwork that benefits

By using Alecs and eVision for image acquisition and image processing, developers can easily tackle common development challenges while gaining key benefits like better efficiency, stronger reliability, and a competitive advantage. The integration of Alecs and eVision libraries helps build higher-quality Machine Vision applications that perform better in the market. The benefits include:



The Alecs User Guides and the User Guide for eVision provide step by step description of setup, image acquisition, and image processing in more detail.

// Reliable Partner/Experts:
Allied Vision's team of experts provides reliable support and guidance throughout the development process, ensuring that customers receive the best possible solution for their specific needs.

// Design Flexibility:
Alecs provides the advanced hardware and Linux-based foundation, giving developers complete freedom to develop and deploy their own applications, integrating any third-party software.

// Accelerated Design-in Processes:
The solution accelerates design-in processes, reducing the time and effort required to develop and deploy Machine Vision applications. This enables customers to get their products to market faster and stay competitive.

// Easy Integration:
The Alecs camera and eVision libraries provide easy integration with existing systems and software, reducing the complexity and cost associated with integrating new technologies.

// Computational Power:
The NVIDIA Jetson Orin processor provides powerful computational capabilities - especially when running in 25W Power Mode - enabling customers to run AI algorithms and perform complex image processing tasks with ease.

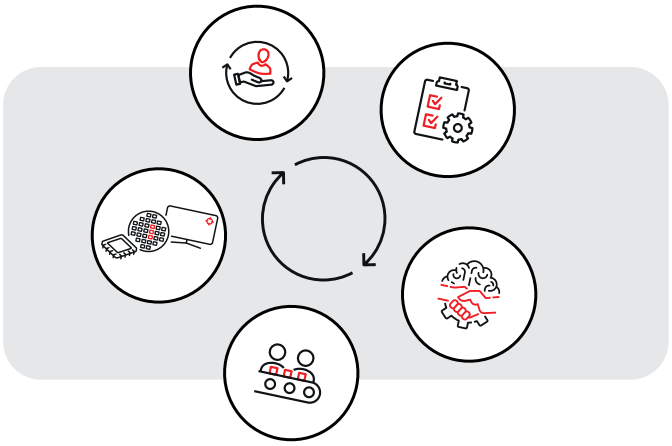
// Industrial-grade Hardware:
The Alecs camera features industrial-grade hardware with IP67 protection, ensuring that it can withstand the rigors of industrial environments and provide reliable operation.

// Advanced Image Processing Features:
The eVision libraries provide advanced image processing features, including those relying on deep learning technologies, enabling customers to develop sophisticated Machine Vision applications.

// Pre-installed eVision Libraries:
The Alecs camera comes with pre-installed Machine Vision software and libraries, reducing the time and effort required to develop and deploy applications.

// Reduced Process Control Loop Time:
The Alecs camera and eVision libraries enable reduced process control loop time, providing an opportunity for increased processing capacity and improved overall system performance.

// Support for Integration:
Allied Vision's team provides comprehensive support for integration, ensuring that customers can easily integrate the Alecs camera and eVision libraries with their existing systems and software.



Get in touch

The development of Machine Vision solutions is a complex task that requires careful consideration of various factors, including hardware selection, software integration, and image processing techniques. By leveraging the power of advanced technologies, such as Deep Learning and computer vision, developers can create effective and efficient Machine Vision solutions that drive business success and competitiveness.

With Alecs at hand, the developer has a powerful setup that provides him with the best possible support for his work. Since a lot of his workload is already taken care of, he can fully focus on his primary task while relying on the system's performance.

Would you like to experience the valuable support of this unique team then contact us.

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