ADLINK
LEADING EDGE COMPUTING

ADLINK AI Machine Vision Solutions — Reinforcing Cleanroom Entry Procedures



AI Machine Vision Solution with Easy Installation and No-code, Visual Development

Use Case

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Semiconductors and panel manufacturers use cleanrooms to eliminate contamination from dust particles. As transistor circuits are extremely small, a single speck of dust on a wafer can cause a short circuit in the transistor, so wafers must be produced in clean zones. Staff entering these zones must wear protective clothing, hats, and shoes correctly, and raise both arms while passing through air shower tunnels, so that dust particles attached to clothing are removed by clean air.

However, some businesses have discovered that even after upgrading their cleanroom facilities, they still experience unstable product yield rates due to dust contamination. Follow-up investigations have shown that personnel noncompliance is to blame, with some staff skipping steps and not lifting both arms and rotating three times, and rushing procedures by walking too quickly through the air shower tunnels or not staying in them long enough, resulting in dust particles exceeding the required standards.

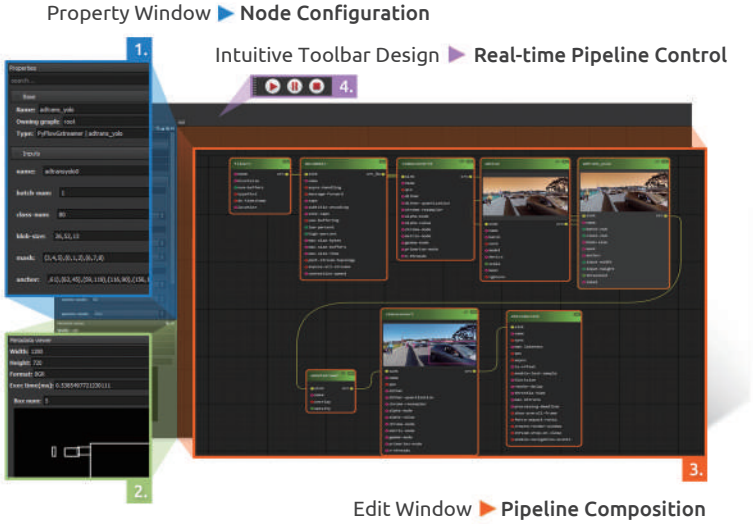
Deploying AI models in production environments is time-consuming and labor-intensive

The company originally designed an AI model that accurately determined the actions of staff in the air shower tunnels and compared them with standard cleaning procedures, displaying a “Pass” or “NG” result. When the plant's in-house AI team received this order, they filmed videos and utilized posture recognition models to weed out incidents of violations before adding their own judgment logic code. Once errors were eliminated from testing, a production environment was compiled to transfer the original staging environment application logic to the production environment's application. However, the process of changing image sources, moving hardware equipment, and rewriting logic programs is extremely time consuming. When attempting to land in house developed PoC, there are still many challenges that must be solved:

- **Imaging setup: AI engineers understand AI, but not imaging. Unfamiliarity with lens selection, light sources, and camera capture settings often wastes significant time and resources.**
- **Environmental restrictions: No drilling is allowed in cleanrooms, only minimal cables are permitted, space restrictions, and other requirements such as fanless PCs to prevent the accumulation of dust.**
- **System reliability: The system must operate reliably to prevent occurrences of image bypass, unstable inference time, and more.**
- **Real-time DIO integration: This is required to implement three-color indicators and voice warnings to notify relevant staff as incidents of violation occur.**

Utilizing visual AI integrated development environments to accelerate deployment

In order to solve the above problems, the company began utilizing commercial solutions to accelerate project deployment. ADLINK’s NEON AI Smart Camera has highly integrated hardware/software environments, built-in EVA SDK (edge vision analytics software development kit), and software that supports protocols for more than 10 types of industrial cameras. Using EVA IDE (edge vision analytics integrated development environment) and a pipeline interface to visualize and preview effects eliminates the need for programming and drastically reduces development time for image acquisition. Thanks to this, image capture settings that usually require approximately 4 hours can be completed within 5 minutes.



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Additionally, the function block within the EVA IDE interface offers a configurable design that allows users to switch an image source from video recording to the camera with a simple drag-and-drop operation. Users need only develop a single program, eliminating the need to spend significant resources to develop multiple sets of programs and transfer program logic due to changes in the image source, resulting in faster development times; in other words, EVA IDE allows users to convert image capture, pre-processing, AI inference, and result output into a clear and visual process facilitating the real-time preview of results and simple logic development. For instance, determining whether personnel are raising their hands can be implemented according to the developer's logic and deploy within two weeks. (insert an image of EVA interface)

Satisfying cleanroom restrictions through fanless design, minimal cables, and simple installation

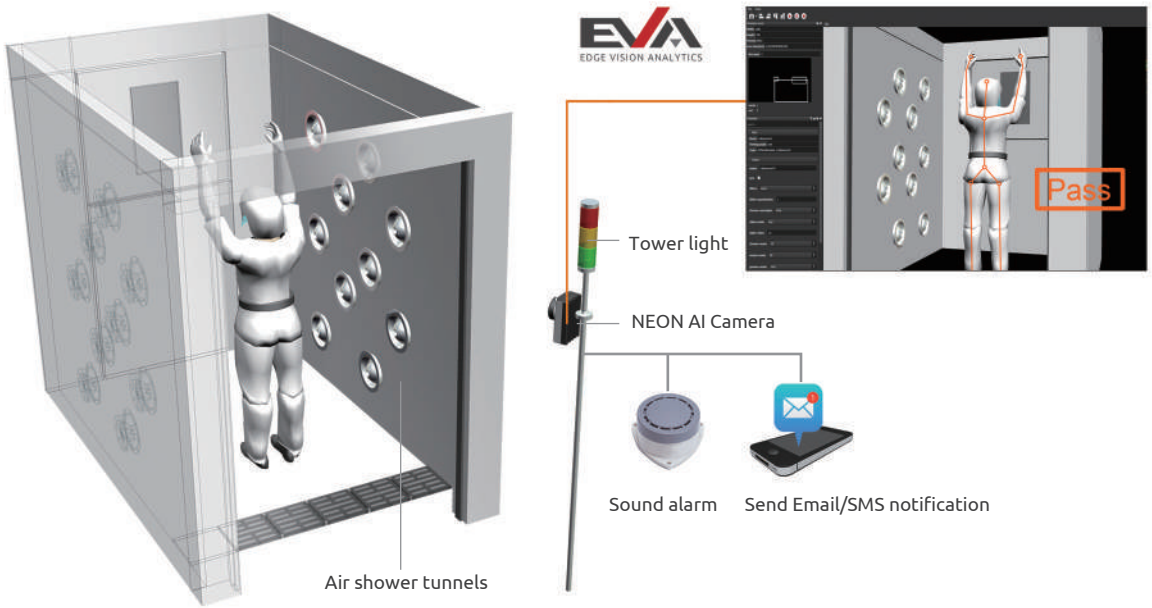
As mentioned above, user challenges not only stem from software development, but extend to the issues caused by the special requirements and restrictions of cleanrooms. In order to enable in-house AI teams to focus on AI vision application development, they should eliminate complex pre-installation, software integration, and verification. NEON AI Smart Camera offers three major advantages in this aspect:

- **Integrated camera and computer: The NEON is an all-in-one device, and requires only one network cable and one power cord to operate, satisfying user expectations for reduced cabling.**
- **VESA mounting interface: The NEON has VESA mounts, so it can be installed on almost any standard mounts available in the market, thereby eliminating the necessity to drill holes.**
- **Fanless design: The NEON has passed rigorous environmental certifications to reduce dust accumulation and decrease power consumption while providing stable performance.**

Additionally, the development boards and webcams available to users for their own development processes often suffer from problems such as poor reliability and certain images being bypassed, producing unstable results; furthermore, additional efforts are required to develop I/O control programs to integrate warning mechanisms such as three-color indicators or warning broadcasts. After adopting NEON, it's possible to reliably and quickly set up all pre-operations such as image capture, verification, and adding algorithms within two weeks to provide stable image capture (no bypass) and inference speeds. EVA SDK also offers an I/O control plug-in to assist users with the swift establishment of I/O control logic through low-code development to easily achieve three-color warning indicators and voice warnings that provide clear instructions of control procedures.

- **Increased compliance: Effective control measures will increase staff compliance with cleaning regulations and prevent dust from entering cleanrooms, decreasing dust volume by 80%.**
- **Warning systems: The real-time three-color warning indicators and voice warnings can immediately correct staff who are not adhering to SOPs.**
- **Rapid setup: Users can complete all pre-procedures from image capture and verification to adding algorithms in two weeks, and rapidly setup and launch systems.**

Furthermore, EVA IDE also provides downloadable pose detection templates that allow developers to quickly build their own AI vision applications, enabling plants without AI development teams to build cleanrooms managed with standard operating procedures.



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