Intel® Edge Insights for Industrial

Intel Works with Microvision to Upgrade Pharmaceuticals Vision Solution

In recent years, emerging technologies are increasingly applied and playing a more and more significant role in the pharmaceutical industry due to the ever-enhancing standardization of the governance of pharmaceutical products. Among them, the machine vision-based pharmaceuticals surface quality inspection technology has become the focus of attention of pharmaceutical factories. The change of pharmaceuticals surface quality inspection from manual visual inspection to automatic inspection not only saves manpower effectively, but also improves the accuracy of inspection, which is of great significance to pharmaceuticals quality control.

The complex environment and the demand for flexible production pose challenges to traditional machine vision solutions

Pharmaceuticals are special products for people's disease prevention and treatment, rehabilitation and health care. Pharmaceutical products are subject to very stringent quality supervision. Factories are committed to producing qualified, high-quality products. Despite the high automation level of pharmaceutical factories, the differences in terms of process control and quality control still significantly affect the quality of finished products. In the process of packaging, the last step of pharmaceuticals production, the blister packaging equipment will complete the packaging of pills and capsules and the inspection of missing materials, but the equipment cannot detect such minor defects as surface cracks, dirt, wear, and wrinkles, which may lead to recalls of pharmaceuticals and increase of production cost. Therefore, pharmaceutical factories usually introduce traditional machine vision solutions to solve this problem, but the complex factory environment and a wide range of product types become obstacles to the deployment and operation of such solutions. Traditional visual inspection systems have a long deployment cycle, which takes a long time to complete parameters tuning . Moreover, they are sensitive to environmental changes, have poor system stability, and the lighting changes at different positions of the production workshops may affect the accuracy of inspection. They cannot adapt to flexible production and, once the production line shifts or the shape of the pill changes, parameters need to be tuned. The cost of customized system solutions and the cost of intelligent transformation are high.

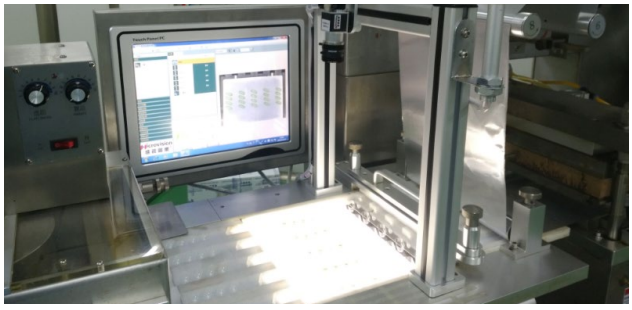


Figure1: A blister packaging machine with solution optimization

Intel and Microvision jointly upgrade pharmaceuticals vision solution

In order to better help pharmaceutical factories solve their pain points, Intel and Microvision jointly launched a deep learning based pharmaceuticals vision solution. The solution uses edge computing technology and deep learning based machine vision to empower pharmaceuticals production and help pharmaceutical factories achieve intelligent upgrading and transformation. Microvision, an industrial cameras and machine vision solutions supplier in PRC, provides intelligent solutions for pharmaceutical and other vertical segments.

This solution, an organic combination of Intel® Edge Insights for Industrial and Microvision's VisionBank intelligent software, integrates traditional vision algorithm and OpenVINO™ Toolkit based deep learning algorithm, and provides an optimized pharmaceuticals vision solution. The solution uses the vision module of Intel® Edge Insights for Industrial and improves the environmental adaptability of the solution by using

the deep learning algorithm. Meanwhile, it reduces the workload of data acquisition, debugging and training model when the products on the production line change. In this way, it can effectively detect defects such as pill and capsule defects, surface cracks, dirt, wear, material leakage and wrinkles, thus improving the production efficiency and inspection accuracy of the factories. The solution supports non-intrusive deployment without large-scale transformation of traditional production lines, saves intelligent costs and facilitates rapid deployment. In addition, it avoids the environmental sensitive problems of traditional algorithms, supports flexible manufacturing and shortens the deployment cycle, greatly improving the production efficiency and product quality of pharmaceutical factories.

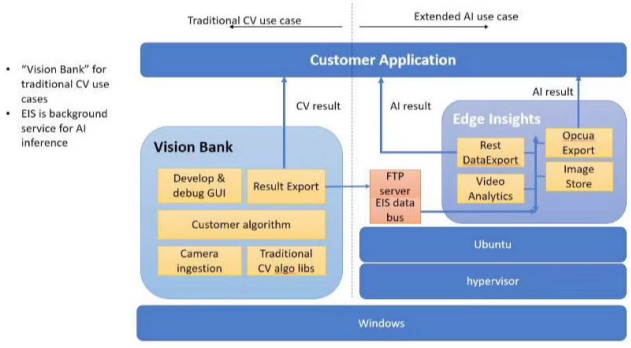


Figure2: Software architecture of the optimized blister packaging solution

Figure3: A blister packaging machine on the production line

In terms of hardware, this solution is based on Intel's hardware platform, supports heterogeneous computing of Intel® Core, Xeon, AI accelerator and other hardware, which provides strong computing power for the solution. In terms of software, Intel® Edge Insights for Industrial and Microvision's VisionBank work together to build a path for data collection, transmission and processing. While meeting the traditional visual needs such as measurement, recognition and positioning, the data collection inference environment and OpenVINO™ Toolkit provided by Intel® Edge Insights for Industrial realize the optimization and acceleration of AI deep learning algorithm. As a whole, this solution supports the application and deployment of intelligent manufacturing from the edge to the cloud, helps its industry customers effectively improve the automation and intelligent level of production lines, optimizes customer process management and operation capabilities, helps pharmaceutical factories reduce costs and increase efficiency, and strengthens their competitiveness.

Intel® Edge Insights for Industrial promotes industry intelligent transformation and upgrading

With the gradual promotion of machine vision and deep learning in the industrial field, more pharmaceutical factories understand advantages of these technologies and hope to apply them to the manufacturing. However, the high investment cost and uncertainty of input-output ratio become concerns of factories. Intel® Edge Insights for Industrial applies the technical advantages provided by these two elements reasonably to optimize the input-output ratio of the solution.

Based on the technical concept of modularization and containerization, the platform interconnects various functional modules in the form of containers through the Data Bus architecture. Each module on the platform can be used independently or jointly. Customers can also freely expand new modules and interconnect them with existing modules of the platform. Intel® Edge Insights for Industrial has flexible architecture and good compatibility. With reasonable modular segmentation, modules developed based on this platform can become independent functional modules. At the same time, the independent module developed by enterprises is reusable. Under different scenarios, if the same feature is required, the enterprise can call the independent module for reuse, thus saving the development cost and development time of the enterprise.

The key advantage of Intel® Edge Insights for Industrial is that the software developed based on this platform can be standardization and platformization architecture. The platform makes full use of the performance of Intel hardware, improves the efficiency of data collection, and embeds OpenVINO™ toolkit to improve the speed of model inference, thus realizing the efficient data collection, processing and analysis to meet requirements of industrial data growth.

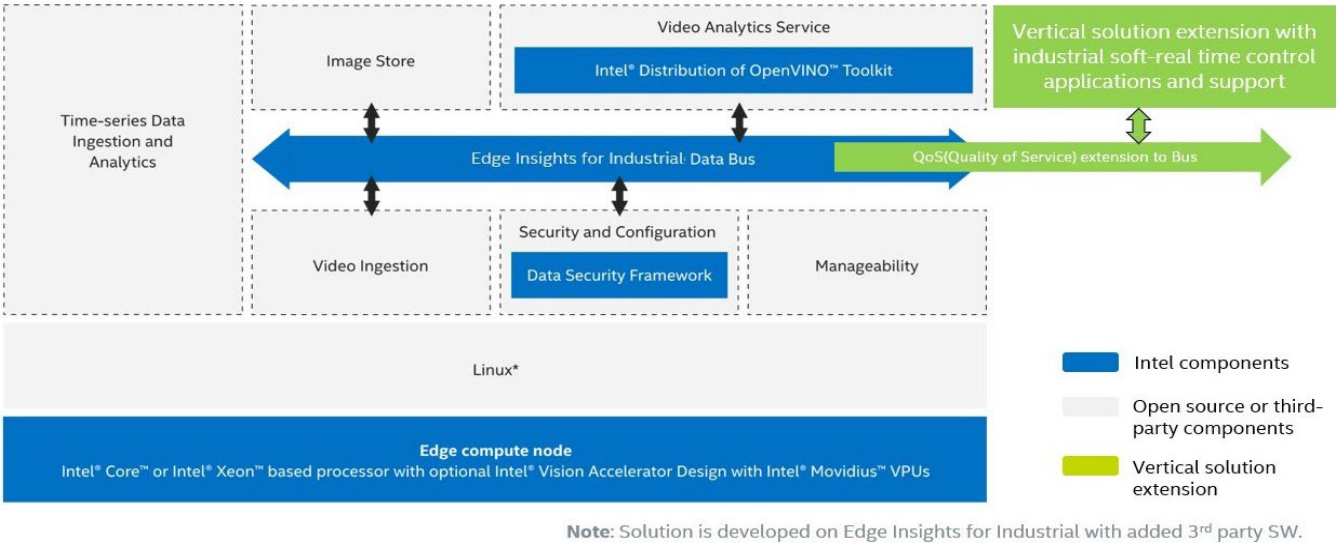
- **The deep learning algorithm based on OpenVINOTM toolkit is applicable to various scenarios, and easy to train new data.** With higher

performance and detection accuracy, this solution overcomes the weaknesses of difficult deployment and complex maintenance in traditional machine vision solutions. It effectively reduces the workload of engineers in scenarios that require a great deal of new data ingestion, debugging, and retraining, such as product line shift and environmental factor change. The OpenVINO™ toolkit can effectively use deep learning and neural networks to improve model inference capability. It supports enterprises to explore 2D/3D machine vision among other technical fields and improve the adaptability of machine vision technology in complicated industrial scenarios.

- **Intel® Edge Insights for Industrial increases the efficiency of system development and optimization for solution developers.** It reduces the development cycle by more than 2 months, saves development costs, and improves enterprise competitiveness. Intel® Edge Insights for Industrial enables a smooth process of data ingestion, storage, analysis, and visualization. Developers can use basic modules provided by the platform directly or develop their own systems based on existing modules and architecture. And the development process is much easier due to modular features, data bus architecture, and software development toolkits, resulting in lower development costs and shorter development cycle.

- **The solution based on Intel® Edge Insights for Industrial delivers efficient edge-cloud orchestration.** Not all data need to be uploaded to cloud in practical applications. Filtered and processed at the edge, only valid data will be uploaded to cloud. This not only saves cloud costs for enterprises, but leverages the low-latency advantage of edge computing to realize efficient cloud-edge orchestration and then complete applying and deploying intelligent manufacturing from the edge to the cloud. Eventually, the solution optimizes the use efficiency of edge and cloud resources to the greatest extent, and maximizes enterprise effectiveness.

At present, every link in a pharmaceutical factory relies on the ingestion, storage, processing, and analysis of massive data - whether it is process parameters optimization, quality control and improvement, and surrounding environment adjustment in the manufacturing process; performance analysis, fault warning, and predictive maintenance of production equipment; analysis and optimization of procurement and inventory in logistics and supply chain; user portrait and value-added service improvement in customer relationship management; or the improvement and optimization of enterprise strategies. The introduction of Intel® Edge Insights for Industrial has significantly improved the efficiency of edge computing. This platform not only benefits mainstream system integrators, hardware suppliers, cloud service providers, communication service providers, and large industrial enterprises. Some start-ups and the customers not categorized as typical "industrial automation" enterprises can also get started quickly and benefit from it.



Note: Solution is developed on Edge Insights for Industrial with added 3rd party SW.

Figure 4: Architecture of Intel®Edge Insides for Industrial

Intel keeps abreast of the times, helps boost Industry 4.0 development

Today, all industries including the pharmaceutical sector is affected by the 4th Industrial Revolution (Industry 4.0) led by intelligent manufacturing. Industrial intelligence will be the key to driving future industrial system. From the Internet to the Internet of Things, and the Intelligent Grid, data processing and analysis have gradually sank to the edge, and edge computing power is becoming a key element of industrial competitiveness. In this new context, Intel will leverage its computing advantage and powerful ecosystem, and work with more industry partners to deploy Intel® Edge Insights for Industrial. Giving full play to its advantages of heterogeneous edge computing, deep learning, and artificial intelligence, Intel will offer continuous computing support for the production of enterprises, helping them achieve rapid production capacity allocation, and flexible and efficient manufacturing. Intel will also provide edge AI solutions for the industrial field among others, empowering enterprises to perform intelligent upgrading and digital transformation at a lower cost in a more flexible architecture.

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