Application Story

AI@Edge: AI Vision in Automated Optical Inspection

Industry: PCB Manufacturing

Product: BOXER-6841M and AI Core XP8

Introduction

An important step in any kind of manufacturing is inspection and defect detection. In manufacturing of printed circuit boards (PCB) the task is carried out with machine vision controllers in an application known as Automated Optical Inspection, or AOI for short. However, with increasing complexity and use of compact components and boards, the task is becoming more difficult for machine vision systems to keep up.

Machine vision is often thought of as a kind of AI, when in fact machine vision is not actually intelligent. Machine vision requires every step and condition be programmed into the system, what is known as hard coded intelligence. As PCBs become more complex, the program can become more complicated and bulky, resulting in errors. With visual inspection, it becomes impractical and almost impossible to try to program every way in which a PCB could have a defect or fault.

One company is creating an AI solution to powering AOI. Their solution offers reduced time to setup and deploy, as AI can be trained to identify faults and defects. AAEON has been working closely to help build and develop the hardware to power their AOI application AI.

Challenges

AOI is one of the most intensive and demanding applications for industrial computing. It requires not just high performance software, but a system that is equally powerful and which can deliver consistent high-performance in an industrial embedded environment. There are several challenges faced when developing an AOI system for PCB manufacturing.

High Processing Demand

In order to process images and signals quickly and accurately, AOI requires a system with high computing power and processor performance.

Visual and AI Processing

To fully meet the needs of AOI, the system needs to support expansion cards, such as graphics/GPU cards or neural accelerator modules to process images and power the AI system.

Cameras and Sensors

Different machines have different configurations and components, from the numbers of cameras and sensors to the type. To meet the full potential of an AI powered AOI solution, the system needs to support a range of I/O connections.

Solution

AAEON worked closely with the developer to provide the best solution for the task. The BOXER-6841M with AI Core XP8 was chosen as the best solution for AOI powered by AI.

Intel Processors

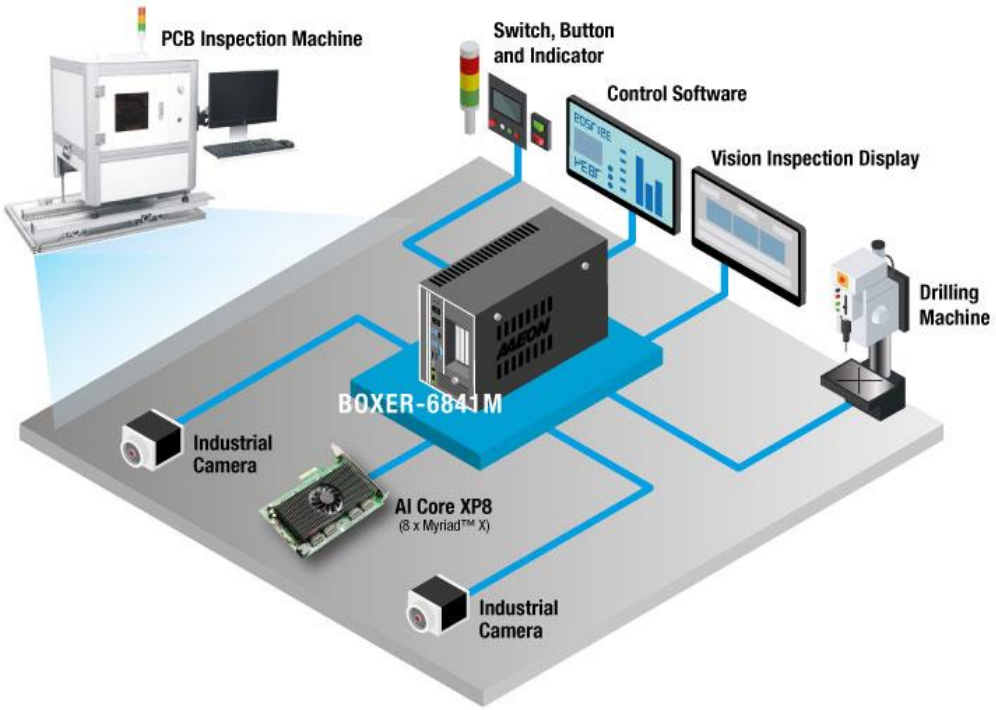
The BOXER-6841M supports 6th and 7th Generation Intel Core processors, as well as Intel Xeon server grade processors. Paired with up to 32 GB of memory, the BOXER-6841M offers high performance processing needed for the most demanding applications.

Expandability

The BOXER-6841M offers a range of expansion bay configurations, including PCIe [x16], PCIe [x8], and PCIe [x1]. This provides users the ability to add in expansion cards to help power Edge computing applications, such as the AI Core XP8 module featuring eight Intel Movidius Myriad X VPUs.

Impressive I/O

The BOXER-6841M is designed for embedded industrial applications, and comes with an impressive range of I/O ports to easily integrate into any project. With five LAN ports and four USB 3.0 ports, it can connect to a wide range of cameras and sensors for use in AOI and other applications.



Impact

Thanks to AAEON's manufacturer support, the powerful BOXER-6841M with AI Core XP8 could push the developer's application to its fullest potential. With the high-performance computing offered by the system, the developer's AOI system can be deployed to inspect multiple product lines without need of reconfiguring, eliminating downtime between production runs or the need for systems dedicated to a single product line. It can also be quickly trained for new products, or to identify previously unknown defects as they are discovered throughout production.

The powerful BOXER-6841M with AI Core XP8 can push the developer's application to its fullest potential.

With the developer's application powered by the BOXER-6841M with AI Core XP8, the system will help PCB manufacturers save time and money, and increase productivity through greater accuracy with fewer mistakes or false positives compared to traditional machine vision based AOI systems. This also means happier customers and end users for manufacturers.

Product

The BOXER-6841M system from AAEON is a powerful embedded industrial PC built for the most demanding of machine vision and AI Edge applications for industrial embedded computing. The BOXER-6841M supports the 7th Generation Intel® Core™ and Xeon™ Server Grade processors for high end computing power. The BOXER-6841M supports up to 32GB of memory, and two hard drive bays to help reach the full potential of processing power. The BOXER-6841M range offers a combination of expansion options, including PCIe [x16], PCIe [x8], and PCIe [x1] expansion slots. This allows for expandability with frame grabber cards for machine vision applications, or AI acceleration with cards such as the NVIDIA GeForce GTX 1080 or the AI Core XP8 from AAEON.

AI Core XP8
PCIe [x4] Card with 8x Intel Myriad X

BOXER-6841M
Embedded Machine Vision System

The AI Core XP8 from AAEON is a PCIe [x4] expansion card featuring eight Intel® Movidius™ Myriad™ X VPUs. This innovative module offers speeds up to 840 fps (560 fps typical) to help power the most demanding of AI applications. By offloading AI inference onto the AI Core XP8, the system processor is freed up to handle other simultaneous tasks, providing an overall increase to system performance and speed. For developers who are unsure of their processing needs, or are in need of a little less power, AAEON also offers the AI Core XP4, with four Intel® Movidius™ Myriad™ X VPUs. The AI Core XP8 and XP4 are compatible with the Intel® OpenVINO™ toolkit, as well as AI frameworks such as TensorFlow. The AI Core XP8 and XP4 can also be configured for compatibility with the developer's own AI inference software.

About AAEON

Established in 1992, AAEON has become one of the leading designers and manufacturers of advanced industrial and embedded computing platforms. Committed to innovative engineering, AAEON provides Industry 4.0 integrated solutions, hardware and intelligent automated services for premier OEM/ODMs and system integrators worldwide, as well as IoT solution platforms that seamlessly consolidate virtual and physical networks. Reliable and high quality computing platforms include industrial motherboards and systems, industrial displays, rugged tablets, PC/104, PICMG and COM modules, embedded SBCs, embedded controllers, network appliances and related accessories. AAEON also offers customized end-to-end services from initial product conceptualization and product development through to volume manufacturing and after-sales service programs. It is also committed to continuously redefining and harmonizing the management and development processes of the industry.

With its constant pursuit of innovation and excellence, AAEON became a member of the ASUS group in 2011, enabling the company to further strengthen its leadership, access advanced technology from ASUS, and leverage resources from within the group. AAEON is poised to offer more diversified embedded products and solutions at higher quality standards to meet world-class design and manufacturing demands in the years to come.

AAEON is an Associate member of the Intel® Internet of Things Solutions Alliance.

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