UPgrading Manufacturing Quality Inspection with the UP Xtreme i12

Introduction

Regardless of the end product, quality assurance is essential to the manufacturing process. At a minimum, a lack of stringent controls can adversely affect consumer confidence in a company's brand. More serious consequences can arise from inadequate quality inspections, particularly in automotive or food and beverage packaging assembly lines.

In an effort to bring a more sophisticated quality inspection framework to a broader range of providers, one company adopted an AI-assisted quality inspection application that could be tailored to meet the specific needs of its clients based on the types of products they manufactured. Meeting all of the application's requirements, the company ultimately chose AAEON's UP Xtreme i12 as the central component of its new AI-assisted visual inspection system.
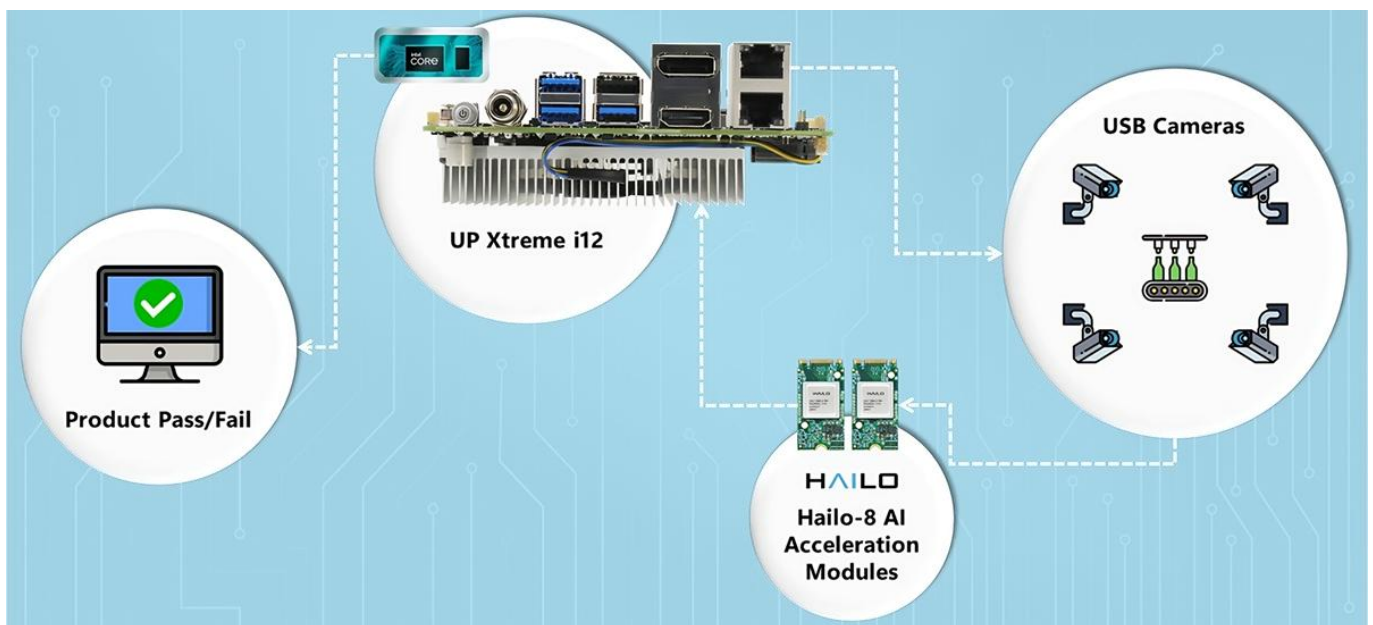
Limitations of Manual Quality Inspection

There are two key things manufacturers value when seeking automated inspection applications: how much improvement it can provide over manual inspection, and the speed with which it can operate while maintaining effectiveness.

In terms of accuracy, factors such as personnel fatigue, the level of experience of the workforce, and the complexity of the product being manufactured all influence the rates of human error in the manual inspection process.

With respect to the second factor, personnel must take the time to ascertain whether a product sample conforms to the required quality standards and is free of defects. An obvious consequence of this is the investment of both time and labor necessary to maintain quality levels throughout the production cycle.

Application Architecture

The UP Xtreme i12: Assuring Quality Through Versatility

Comprehensive Visual Coverage

When searching for a product to power their quality inspection application, the company had a number of requirements. The first of these was the product's ability to support multiple cameras, as the system needed to capture visual data of the article being inspected from multiple different angles to ensure comprehensive coverage.

Equipped with a broad selection of USB interfaces, including three Type-A ports operating at USB 3.2 Gen 2 speeds and a USB 4.0 Type-C port, the UP Xtreme i12 was more than capable of fulfilling this requirement.

Advanced Processing with Intel Iris Xe Graphics

A second reason the client chose the UP Xtreme i12 was its 12th Generation Intel® Core™ i7 CPU, the hybrid architecture of which was ideally suited to the application.

With four performance cores optimized for the rapid analysis of visual datasets and eight efficiency cores designed to efficiently manage background processes, the UP Xtreme i12's CPU offered the ideal blend of raw processing power and efficient operation for high-performance, low-latency tasks.

An additional benefit of the board's processor platform was its integrated Intel® Iris® Xe graphics. Its accelerated encoding and decoding capabilities facilitated the real-time management of multiple video and image data streams from the cameras installed on the board.

Furthermore, the Intel® Iris® Xe graphics package enhance the application with high-quality video rendering, delivering clearer images for detailed visual inspection.

Power-Efficient AI Acceleration

The UP Xtreme i12's expansion options were arguably its most significant benefit. With two M.2 2280 M-Key slots (PCIe Gen 4.0 x4), the board could accommodate two Hailo-8™ AI acceleration modules, delivering a combined 52 TOPS of AI performance.

The integration of these modules meant the application could run advanced AI models built using a variety of development frameworks. The integrated software toolset of the Hailo-8 ™ modules also allowed for the training, retraining, optimization, and translation of algorithms developed using various machine learning frameworks, a benefit when considering the application would be tailored for different companies producing different types of goods for end customers.

Application Impact

It is estimated that the accuracy of defect detection using manual inspection is approximately 80%, with variations across industries based on the complexity and scale of the products or components being manufactured. Meanwhile, Convolutional Neural Networks (CNNs) and deep learning-based object detection models have demonstrated consistent error detection rates of 99% or higher in the evaluation of both consumer products and precision-manufactured components.

This increased accuracy, combined with the improved efficiency of the application compared to manual inspection, clearly demonstrated that by deploying the AI-assisted visual inspection application, manufacturers could establish more robust quality assurance processes while also decreasing the time required to identify product defects.

About AAEON

Established in 1992, AAEON is one of the leading designers and manufacturers of industrial IoT and AI Edge solutions. With continual innovation as a core value, AAEON provides reliable, high-quality computing platforms including industrial motherboards and systems, rugged tablets, embedded AI Edge systems, uCPE network appliances, and LoRaWAN/WWAN solutions. AAEON also provides industry-leading experience and knowledge to provide OEM/ODM services worldwide. AAEON works closely with premier chip designers to deliver stable, reliable platforms. For an introduction to AAEON's expansive line of products and services, visit www.aaeon.com.

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