DFI

Automated Fruit Classification with DFI's Expandable Fanless Embedded Systems

As the global smart agriculture market continues to experience rapid growth, GRAND VIEW RESEARCH projected to reach US$ 54,711.6 million by 2030 with a compound annual growth rate (CAGR) of 13.4% from 2024 to 2030. The adoption of AI in automated agriculture is steadily increasing each year, and emerging technologies like drones and automated fruit classification are playing a pivotal role in transforming agricultural practices.

DFI provides a diverse range of industrial application systems, with numerous successful deployments in the smart agriculture sector. These applications include various types of autonomous agricultural machinery, fruit sorting solutions, and more. Today, we will explore how DFI's expandable systems are pivotal in fruit sorting, driving improved operational efficiency.

Industry: **Smart Agriculture**

Application: **Fruit Sorting Machine**

Solution: **DFI EC6 Series- EC600-RPS, EC622-RPS, EC633-RPS & EC633D-RPS**

Optimizing Agricultural Product Grading with AI for Improved Accuracy and Efficiency

The production environment for agricultural products differs greatly from that of industrial products. While industrial products have predefined specifications, agricultural products, even from the same field, can vary in size, weight, appearance, and other factors. These variations affect pricing, making grading a crucial task in the food and agriculture supply chain. Since agricultural products deteriorate over time, it's essential to track changes in specifications at every stage of the supply chain—such as warehousing, logistics, and sales—to ensure quality management and a stable supply downstream.

To enhance the accuracy and efficiency of fruit classification while reducing labor costs, one of our automation solution providers has implemented DFI's expandable fanless embedded systems for an advanced fruit sorting system, which has been successfully deployed in countries such as Israel, Japan, the USA, and more. This system uses AI algorithms to analyze fruit images, quickly identify defects, and classify the fruits based on factors such as size, color, and quality. Not only does this improve classification accuracy, but it also accelerates the distribution process, addressing the challenge of detecting subtle defects that are difficult to spot with the naked eye, ultimately optimizing the fruit sales and export process.

Innovation in Fruit Sorting and Processing in Smart Agriculture: DFI's Expandable Fanless Embedded System Helps Customers Enhance Efficiency

After harvest and transportation, the fruit undergoes processing to maintain its quality and appearance. For example, apples go through brushing, washing, and waxing machines to clean, shine, and preserve them, followed by a drying machine to set the coating. The apples are then passed through a sorting machine for quality classification. Fruit sorting organizes the fruit by quality, discarding those that do not meet the minimum standards. Poor quality management during this process, especially for exported fruit, could result in losses for either farmers or distributors. Therefore, fruit sorting is essential in ensuring the final product quality throughout the entire production and sales process.
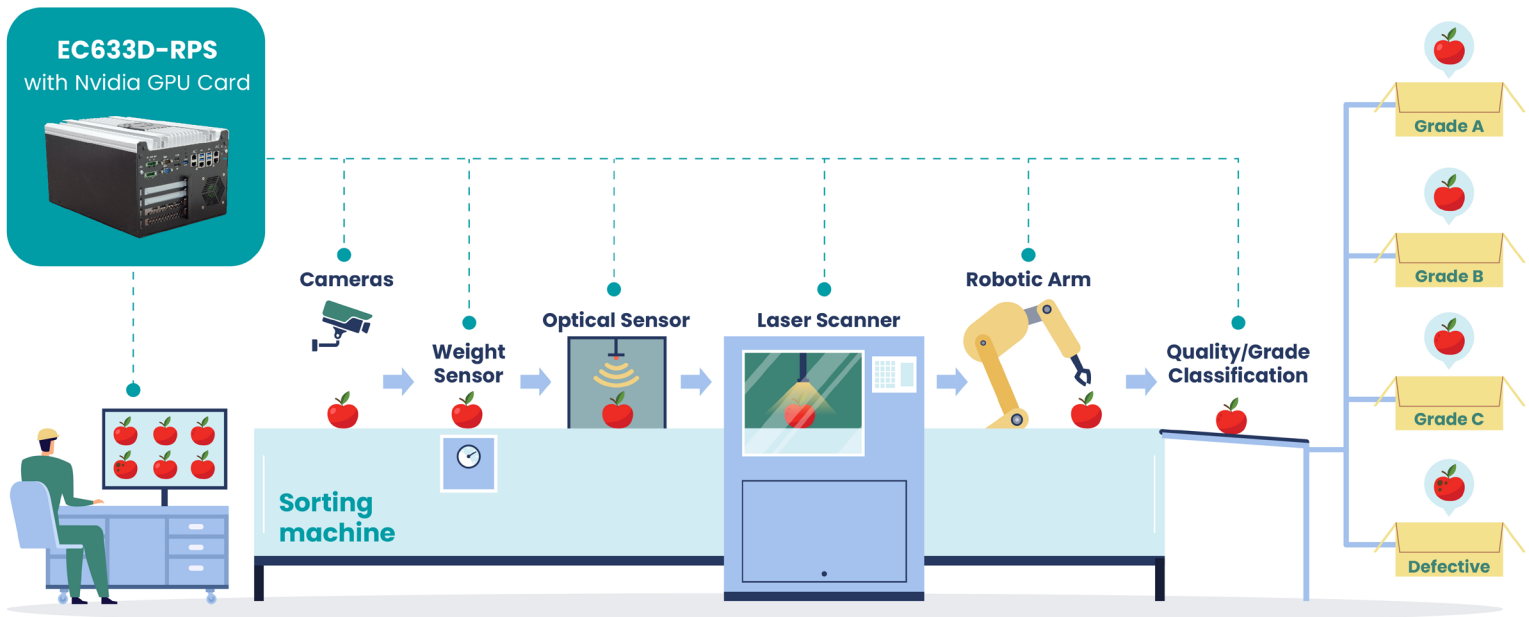
Machine vision has played a significant role in the growth of smart agriculture by tackling the high labor costs associated with traditional sorting methods. Using AI-driven image recognition and processing, the detection system can simultaneously analyze multiple image data points, including surface defects, fruit shape and size, measurement data, and digital photo file storage.

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Washing | Waxing | Grading

One of our customers chose DFI's expandable fanless embedded system, a high-performance edge AIoT solution built for applications that demand substantial computational power, making it the perfect fit for fruit sorting operations. With the capability to support cutting-edge graphics cards like the RTX 4070 and beyond, this system seamlessly integrates with a wide range of sensor technologies, enhancing the accuracy and efficiency of the sorting process. The entire vision system is connected to DFI's expandable fanless embedded system, built with advanced camera technology, captures detailed fruit appearance data to detect surface imperfections, color variations, and other visual features. Optical sensors are essential for measuring fruit size and detecting its presence, ensuring precise identification of each piece. Laser scanners further enhance precision by providing accurate measurements of distance and shape, refining the sorting process. Additionally, weight sensors transmit real-time weight data to the sorting decision system, enabling automated classification based on predefined parameters.

Beyond its sensor capabilities, DFI's expandable fanless embedded system stands out with its robust I/O features, enabling seamless interaction with various control and execution devices for smooth, uninterrupted operations. Motor drivers regulate the speed of sorting chutes and conveyor belts, optimizing the flow of fruit. Robotic arms handle more complex sorting tasks, performing precise movements to manage delicate fruits. Pneumatic valves, in conjunction with pneumatic diverters, facilitate sorting based on size or quality, offering greater flexibility in classification. Integrated alarm lights and buzzers provide immediate error alerts, allowing operators to quickly address any anomalies.

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EC633D-RPS
with Nvidia GPU Card

Cameras

Weight
Sensor

Optical Sensor

Laser Scanner

Robotic Arm

Quality/Grade
Classification

Sorting
machine

Grade A

Grade B

Grade C

Defective

Explore DFI's Expandable Fanless Embedded Systems EC6 Series- EC600-RPS, EC622-RPS, EC633-RPS & EC633D-RPS

The EC6 Series is equipped with 14th/13th/12th Generation Intel® Core™ processors and DDR5 SODIMM memory, offering a maximum capacity of 64GB and providing outstanding computing performance for demanding AI and machine vision applications. With its modular design and expandable features, DFI offers various SKUs that support up to a full-size expandable mini-PCIe slot, three PCIe expansion slots, and five M.2 slots, delivering exceptional flexibility for integrating high-performance components. Whether you need to add a powerful GPU or a specialized M.2 AI acceleration card, these systems are optimized for high-demand machine vision tasks. The EC6 Series supports up to four independent display outputs, ensuring versatile connectivity for complex setups. It also supports a wide array of I/O options—including 9 COM ports, 5 USB ports, 1 USB-C port, 6 LAN ports (2 2.5GbE & 4 GbE), HDMI, DP++, and VGA—guaranteeing reliable connectivity in challenging industrial environments.

DFI is dedicated to improving the user experience of its customers' products. DFI's in-house Out-of-Band (OOB) functionality enables remote management, even when the system is unresponsive or powered off. These systems support DFI M2A-OOB with troubleshooting capabilities, allowing secure remote access to diagnose and resolve issues, thus enhancing remote system management and minimizing downtime.

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DFI's EC6 Series – Key Features

Learn more about DFI's EC600-RPS, EC622-RPS, EC633-RPS & EC633D-RPS

EC633D-RPS `R680E`

14th/13th/12th Gen Intel® Core™
Modular-Designed Embedded System

KEY FEATURES

DDR5
DDR5 SODIMM up to 64GB

Wide-Temperature
Operating temperature: -20 to 70°C

Support OOB
DFI OOB module (M.2 3042 A key)

Multiple Expansion
5 M.2 slots (1 M.2 2230 E key, 2 M.2 2280 M key, 1 M.2 3042/3052 B key, 1 M.2 3042 A key) 1 mini-PCIe slot (full size)

Rich I/O
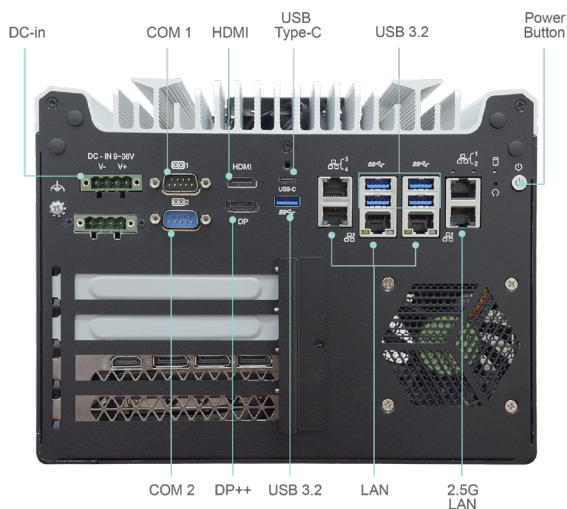2 2.5GbE, 4 GbE, 5 USB3.2 Gen2, 1 USB type-C, 1 VGA, 1 HDMI, 1 DP++, 9 com port

5G
Support 5G Communication
Support 5G communication

PANEL

Front View

Rear View

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Founded in 1981, DFI is a global leading provider of high-performance computing technology across multiple embedded industries. With its innovative design and premium quality management system, DFI's industrial-grade solutions enable customers to optimize their equipment and ensure high reliability, long-term life cycle, and 24/7 durability in a breadth of markets including factory automation, medical, gaming, transportation, smart energy, defense, and intelligent retail.

www.dfi.com / inquiry@dfi.com / +886 (2) 2697-2986