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Titanium
IoT Solutions

DFI

Unlocking Agility: DFI's AI-Enabled Systems with Intel Meteor Lake Processor Drive Transition for AMRs

Background of Story

Autonomous mobile robots (AMRs) have seen a surge in popularity in recent years, particularly in the manufacturing and warehousing sectors. Ensuring safe navigation in a dynamic environment is no easy task, as vehicles must adapt to changes in their surroundings for successful production processes. AMRs offer an intelligent solution to this problem, optimizing procedures in terms of speed, cost, and safety.

Industry: **Factory Automation, Logistics**

Application: **AMR**

Solution: **Fanless Edge AI Inference System:
DFI X6-MTH Series**



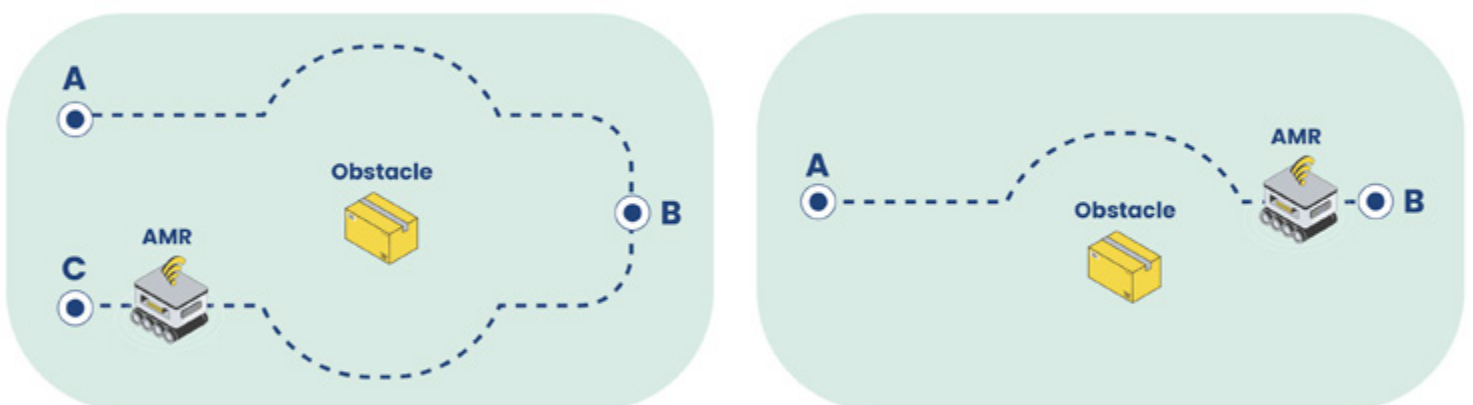
Background of Story

In turn, AMRs require more sophisticated hardware and operating systems, typically relying on optical methods such as lasers and imaging to create and localize maps for navigation, without the need for preset navigation paths. With additional features like system flexibility, rapid deployment, and seamless integration, AMRs can execute more intricate operations, leading to widespread adoption and integration. DFI's AI-enabled systems are an outstanding offering in the booming global AMR market.

Why customers use AMRs

1. Smooth human-machine collaboration.
2. Easily adaptable to changes in the work environment.
3. Shorter operating distance by workers.
4. Less human errors.
5. Increased productivity through workflow improvements.

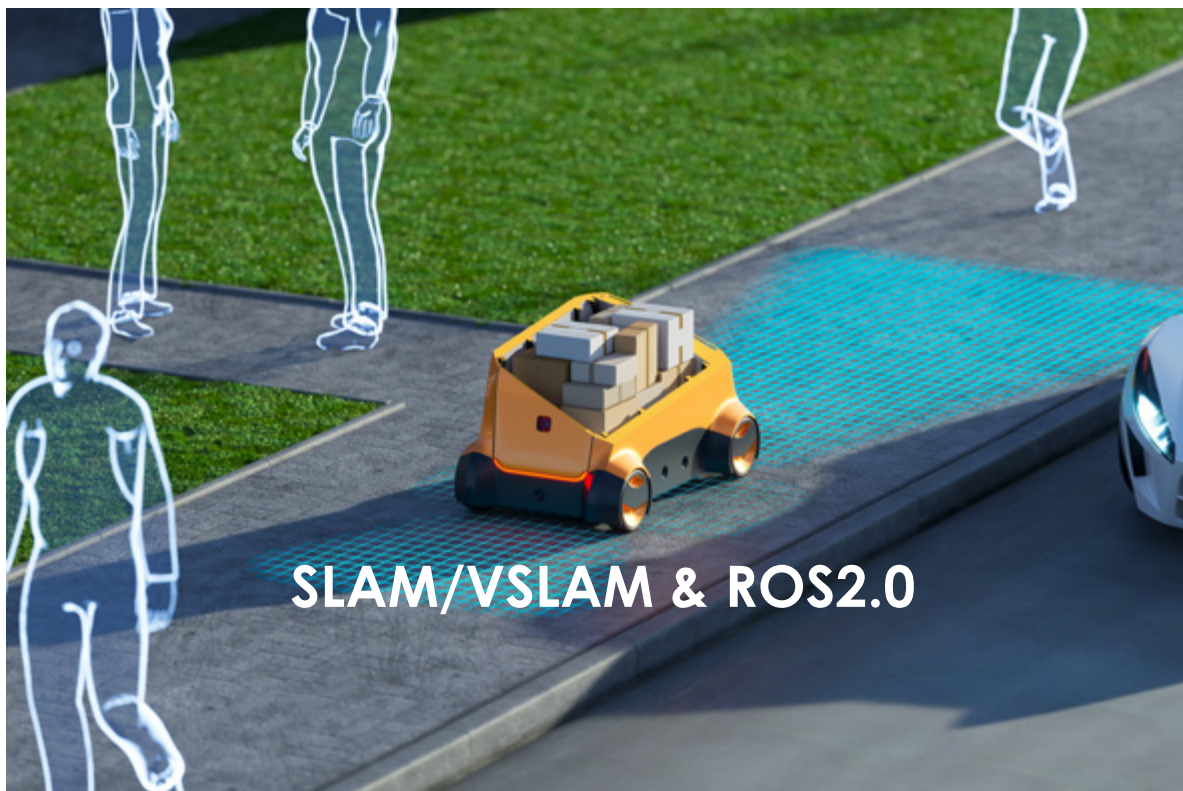
AMR obstacle avoidance



Why customers use AMRs

According to Mordor Intelligence, the autonomous mobile robot (AMR) market is projected to reach US\$3.88 billion in 2024, with expectations to achieve US\$8.02 billion by 2029, indicating a compound annual growth rate (CAGR) of 15.60% over the forecast period (2024-2029).

One of our customers is exploring the adoption of AMRs capable of intelligent path planning in line with business upgrades. Our customer has conducted two evaluations. The first involved utilizing camera detection to enable visual-simultaneous localization and mapping (VSLAM), while the second explored the pairing of light detection and ranging (LiDAR) and simultaneous localization and mapping (SLAM). Both evaluations can leverage the distributed architecture system of Robot Operating System (ROS) 2.0 to facilitate real-time communication with other AMRs, accomplishing intelligent path planning and obstacle avoidance. As a result, there is a rising demand for high computing performance in industrial computers, leading customers to request DFI's embedded solutions.



DFI's Response & Results

Machine Vision and SLAM Technologies in Modern AMRs

In the realm of machine vision, contemporary warehouses and distribution centers necessitate specific technology to enable AMRs to operate autonomously without external cables or ground sensors. Machine vision and navigation are integral components for this. Modern AMRs are equipped with stereo cameras that generate real-time video of surroundings, preprocessing depth maps to calculate object positions and depths. Mathematical mapping algorithms, such as random sample consensus (RANSAC), piece together a 3D map for the purposes of path planning, obstacle recognition, and collision avoidance.

SLAM and ROS technologies are pivotal in enabling industrial PC systems with machine vision. SLAM algorithms allow machines to generate maps of the environment while simultaneously determining their positions within, facilitating accurate navigation and interaction with surroundings. ROS provides a comprehensive framework for developing and managing robotic software, offering tools and libraries tailored to various robotic applications, including machine vision.

Through the integration of SLAM and ROS, AI-enabled machine vision systems can efficiently process visual data, interpret environments, and make real-time decisions. This integration enhances capabilities, granting greater precision and reliability to tasks such as object recognition, localization, and navigation. Businesses across industries can leverage SLAM and ROS technologies to optimize automation processes, enhance operational efficiency, and drive innovation forward.

Introducing the X6-MTH Series Edge Box PC

DFI's X6-MTH series fanless industrial PC features Intel® Core™ Ultra processors from Meteor Lake. It comes with NPUs for AI, 14 CPU cores (6P+8E), 8 Xe-cores (128 EU), and a NPU (11 TOPS) within a 15-28W TDP, delivering 1.9x the GPU performance of the Raptor Lake generations. With the combined computing power of CPU and GPU, all 14th Gen Intel® Core™ Ultra processors can reach up to 32 TOPS.

The X6-MTH series stands out as a robust and versatile platform, ideal for AMR integration with efficient computational performance. DFI offers flexible modules, such as Nvidia ORIN NX or MXM, to enhance computing power on the X6-MTH platform. Notably, the version with NVIDIA Jetson Orin NX can deliver up to 100 TOPS, making it highly suitable for AMR applications. Please contact DFI for more information on this model. DFI remains committed to providing reliable hardware solutions, supporting numerous customers in factory transformation and upgrades.

Meteor Lake processors accelerate developers' deployment efficiency

Intel® Core™ Ultra processors are supported by the Intel Compute-Runtime stack, providing oneAPI Level Zero support. Intel OneAPI is a comprehensive software development toolkit designed for high-performance computing. It offers a unified programming model and tools that allow developers to easily harness the power of different types of processors and accelerators, speeding up application execution. Thanks to Intel OneAPI, Intel CPU and GPU computing capabilities will make possible new milestones in the field of AMR edge computing.

X6-MTH-ORN KEY FEATURES



Nvidia Edge AI engine

Nvidia ORIN NX up to 100 TOPS



Control engine by Intel Core Ultra

Remote control by Intel Core Ultra processor



Remote BIOS update and OTA

Support Remote management by DFI OOB



Multiple Expansions

4 M.2 B, E, M key expansion slots



Optional Displays

Optional MXM supported with 3 DP and 1 HDMI ports



Rich I/O

4 USB 3.2, 4 RJ45 GbE, micro USB, Serial, CAN bus

PANEL



Front View



Rear View

DFI

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