

CASE STUDY

Integrating smartmicro Radar with Au-Zone's AI-Powered Perception Solutions

Introduction: Advancing AI-Based Visual Perception at the Edge

Au-Zone Technologies is a leader in embedded computer vision, Edge AI and sensor fusion solutions, dedicated to empowering clients with intelligent, edge-based spatial perception technologies. Their EdgeFirst™ Studio and Raivin radar-camera sensor exemplify their commitment to delivering reliable spatial perception solutions for the off-road vehicle industries, including construction, mining, agriculture and robotics. A crucial aspect of this innovation is Au-Zone's unique ability to perform AI based sensor fusion, combining low-level radar and vision data for enhanced situational awareness and operational safety in dynamic and uncertain operational conditions.

Market Context: The Demand for Robust Perception Solutions

The off-road and industrial vehicle perception technology market is expanding as industries seek cost effective, scalable solutions that ensure safety and autonomy in challenging environments. Key manufacturers of off-road vehicles have been investing in automated systems to improve operator awareness, pedestrian safety, and operational efficiency. This trend underscores the importance of reliable, AI-based perception systems that withstand harsh conditions like dust, fog, and difficult terrain.

Challenge: Limitations of Traditional Visual Perception

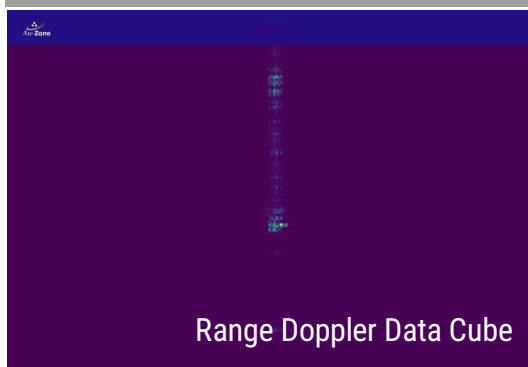
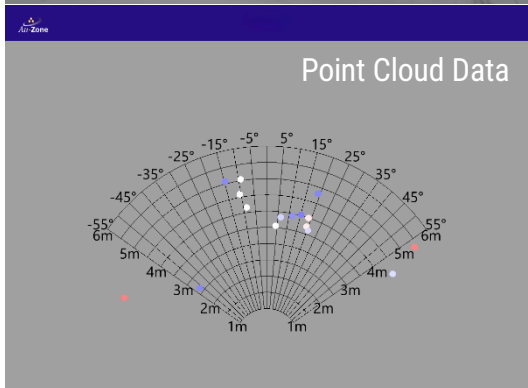
Traditional visual perception systems, heavily reliant on camera-based technologies, often face significant challenges in off-road environments. Factors like dust, bright sunlight, and fog can compromise the performance of vision-based systems, leading to missed detections and reduced reliability. These limitations prompted Au-Zone to seek an alternative to provide greater environmental resilience.

Solution: Integration of smartmicro's Advanced Radar Technology

Au-Zone identified smartmicro's DRVEGRD radar sensors with the available Radar Cube Streaming firmware as the optimal solution due to its unique capabilities. Unlike conventional radar outputs limited to object tracking or point clouds, smartmicro's Radar Cube Streaming provides access to low level radar data earlier in the signal processing pipeline, which inherently includes more information and is richer in features, thereby allowing for deeper, more granular analysis.

"The combination of smartmicro's Radar Cube Streaming and the proprietary Radar+Vision sensor fusion architecture of the EdgeFirst™ Fusion Perception Engine enables a level of detection that's unmatched in off-road environments"; said Brad Scott, CEO.

How It Works: Low-Level Fusion for Superior Perception



Integrating smartmicro's radar sensors into the Raivin Module enables the fusion of raw radar and RGB camera data. This low-level sensor fusion preserves rich data from both sensors, allowing the perception engine to process a comprehensive, unified data stream before generating object classification, segmentation and localization outputs. This approach contrasts with traditional late-stage fusion, where object assessments are done independently on data from individual sensors and risks losing critical information degrading accuracy and precision.



"Our Radar Cube Streaming was designed for developers who are seeking richer, low-level radar data with more features per frame to develop systems able to detect and track targets with higher accuracy and precision in extremely challenging scenarios. Au-Zone's implementation demonstrates the true potential of this technology in rugged, real-world applications", said Daniel Reitenauer, Chief Sales Officer at smartmicro

Unique Capabilities and Benefits

- ✓ **Resilience to Environmental Challenges:** Radar+Vision data helps ensure that perception remains effective in conditions that challenge camera-only systems, such as low visibility, direct sunlight and dust or dirt buildup on optics.
- ✓ **Field-Ready Hardware:** The compact design of the smartmicro radar sensor allows for seamless integration directly into the Raivin Module, resulting in a durable, high-reliability solid-state design with simplified wiring and no need for field calibration or alignment.
- ✓ **AI-Accelerated Tooling:** For those looking to customize the Raivin, Au-Zone's EdgeFirst™ Studio provides AI assisted tooling to accelerate the process of creating tailored solutions, for unique object detection, tracking, or environmental conditions.
- ✓ **Enhanced Safety and Object Detection:** Low-level fusion improves the detection and tracking of objects, including pedestrians, by maintaining the integrity of raw sensor data.

Outcome: A Turnkey Perception Solution

By combining smartmicro's radar technology with Au-Zone's Fusion Perception Engine, the Raivin provides users with a field-ready solution that can be readily deployed in off-road vehicles, overcoming the most difficult perception conditions, to enhance operator awareness, site safety and machine autonomy.

"Our ability to perform sensor fusion on the low-level radar data using smartmicro's Radar Cube Streaming has allowed Au-Zone to continue pushing the boundaries of what's possible with AI-based perception at the edge", said Brad Scott, CEO.

Conclusion: Redefining Perception for Off-Road Industries

Au-Zone and smartmicro have established a groundbreaking approach to perception technology, leveraging radar and vision fusion to tackle the unique challenges of off-road environments. Their partnership positions Au-Zone as a leader in robust, edge-based perception solutions that meet the evolving needs of equipment manufacturers and operators in demanding industries.

About Au-Zone Technologies

Au-Zone Technologies stands at the forefront of embedded Computer Vision, AI, and Spatial Precision technologies, empowering our clients to confidently deploy the latest in intelligent perception and applied solutions. With over 15 years of experience as a trusted technology partner, we collaborate with OEMs, engineering teams, and research groups across diverse industrial sectors, including Commercial Video Telematics, Marine Mapping, Space Automation, Off-Road Equipment, and Autonomous Robotics Platforms. EdgeFirst™ Studio, our advanced 3D Spatial Perception Technology, featuring an industry-first Radar+Vision Perception Engine, AI-accelerated tooling, and field-proven AI models, facilitates the rapid development of machines capable of safe and autonomous operation in dynamic and unpredictable environments.

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