You Cannot Be Serious!

AAEON & Zenniz Bring Tech to Tennis

Overview

In June 1981, the world heard the now-infamous line, “You cannot be serious!” as John McEnroe disputed a line-call during his first-round match against Tom Gullikson at Wimbledon. While the interaction became a mainstay in popular culture, the scenario within which it took place is not uncommon.

Even with the intricate knowledge and keen eye of tennis umpires, the fast-paced nature of tennis makes judging close calls exceptionally difficult. Meanwhile, sports such as football, rugby, and track and field have undergone a technological revolution, allowing officials to review on-field activity to ensure decision-making is consistent.

Despite its global popularity, however, tennis has yet to see the major rollout of such measures. Recognizing the potential that such technological advancements could have on the sport, Zenniz developed an end-to-end smart tennis court system, revolutionizing the way tennis is played, coached, and experienced.

Following the successful launch of their application, Zenniz contacted AAEON seeking an embedded system capable of streamlining and scaling their operations, successfully doing so with the help of AAEON's BOXER-8658AI.

The Ins and Outs

Zenniz's smart tennis court system served two primary purposes, the first of which was to automate decisions on the court to provide players with immediate, on-court calls through an electronic line calling. The second was to bring AI-driven performance analysis to players and coaches in an accessible way. By providing both immediate, accurate decision-making and a platform through which insights could be received alongside match highlights, this application aimed to help players elevate their game and improve the overall experience players have on and off the court.

The first generation of the application relied on a custom x86 motherboard as its primary controller, joined by a Power over Ethernet (PoE) switch to connect cameras installed around courts. A key issue with this architecture was that it required over 150 components to operate. Consequently, Zenniz felt a fully embedded platform would be required to scale their operations as adoption grew.

Product Suitability: Finding the Right Match

Given their existing smart tennis court system utilized Axis cameras connected to the primary compute unit via a PoE switch, Zenniz requested a system with integrated PoE support.

This would not only reduce the number of components required to run the application, but simplify the deployment and maintenance of their solution.

Secondly, given the product would need to have enough computing power to execute Zenniz's advanced computer vision algorithms without the risk of overheating. This was particularly important because the system would be placed within an enclosure on outdoor tennis courts. As a result, it needed to reliably operate in all climates, especially given the strain that a high compute workload can have when combined with sustained high temperatures.

Finally, the chosen solution needed a diverse onboard I/O capable of various functions. One such need was a means to transmit data to Zenniz's cloud platform. Meanwhile, the system would have to be able to display electronic line calling decisions on LED panels on the court.

With these technical and operational requirements clearly defined, Zenniz began their search for an embedded system capable of meeting these needs. This process ultimately led to them finding the BOXER-8658AI, a fanless embedded AI system from AAEON's BOXER Edge AI solutions range.

The Top Seed: AAEON's BOXER-8658AI

Initial project discussions often entail AAEON sales representatives gathering an in-depth outline of a customer's proposed application and using this information to provide a range of suitable platforms. Zenniz, however, proactively approached AAEON to enquire about the BOXER-8658AI specifically. As AAEON's sales team delved further into Zenniz's project, they found the system to be the ideal choice.

Multi-Camera Support

The first feature that drew Zenniz to the BOXER-8658AI was the system's eight PoE LAN ports. With these onboard, they reasoned, the system could directly support the multiple Axis cameras needed to capture video data during matches.

Ethernet-to-Cloud Connectivity

The BOXER-8658AI's two standard Gigabit Ethernet RJ-45 ports also helped to streamline the application's setup. Using one of these ports, the BOXER-8658AI could transmit data to the Zenniz cloud platform via wired Ethernet connection.

Computing Power

Capable of up to 100 trillion operations per second (TOPS) of AI performance via an integrated NVIDIA® Jetson Orin™ NX module, the BOXER-8658AI was more than capable of executing Zenniz's proprietary computer vision algorithms. Moreover, its native NVIDIA Jetpack™ support allowed Zenniz's ball-tracking and line-calling models to be deployed directly without needing to build complex software infrastructure from scratch.

Environmental Ruggedness

Designed to thrive in even the harshest conditions, the BOXER-8658AI boasted a -15°C to 60°C temperature tolerance and broad 9V to 36V power input range. This was a major benefit to Zenniz, making the core hardware of their application location-agnostic, removing the need for additional ruggedization when deployed in locations with extreme climates or differing electrical infrastructure.

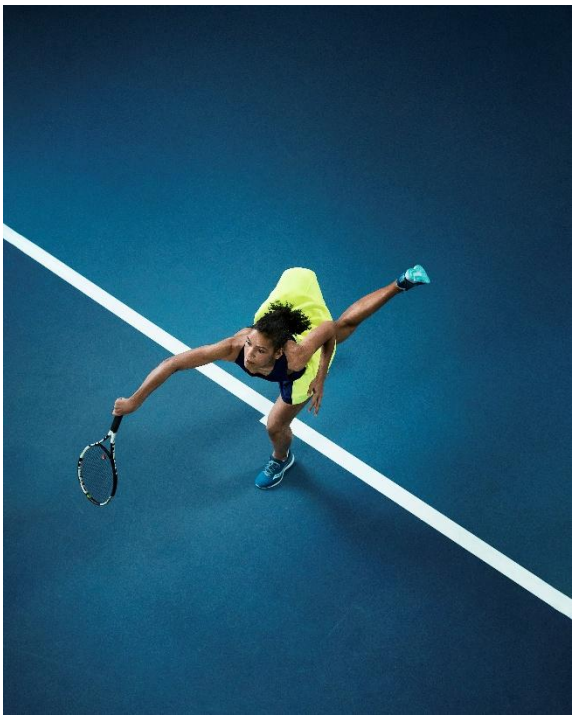
Application Architecture

The BOXER-8658AI acted as the central hub of Zenniz's smart tennis court system. Connected through the platform's PoE ports, Zenniz positioned multiple Axis cameras around the court to continuously monitor play and capture video data. This data was in turn analyzed by Zenniz's proprietary computer vision algorithms, executed using the BOXER-8658AI's integrated GPU.

With two 500mm x 500mm full-HD on-court LED displays receiving signals from the BOXER-8658AI's HDMI port via a sending card, electronic line calling decisions were shown instantly, allowing games to retain their natural flow. Meanwhile, performance analytics were uploaded to Zenniz's cloud platform through the system's rear LAN port to the court's network.

By centralizing all court operations through the BOXER-8658AI, Zenniz was able to streamline all facets of its application to ensure consistent performance, setting the stage for measurable improvements in deployment efficiency and player experience.

The Outcome? A Grand Slam



With the BOXER-8658AI at the heart of its Smart Tennis Courts, Zenniz continues to bring the technological revolution to the tennis world. By transitioning from its original custom motherboard setup to AAEON's fully embedded system, the total number of components required to transform a tennis court into a Zenniz smart tennis court has been reduced from over 150 to just 20, dramatically simplifying deployment.

Consequently, Zenniz can bring an all-in-one, data-driven system to anyone, from beginners in clinics to competitors in tournaments.

Driven by innovative thinking and a love for the game, Zenniz is now ready to continue its expansion, with smart tennis courts currently implemented in 25 countries ranging from Brazil to Bulgaria, the USA to the UAE.

Discover more about how Zenniz is revolutionizing the way tennis is played, coached, and experienced today by visiting their website here.

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.