

Vision-Based Adaptive Welding Solutions for the Top Three Challenges in Welding Fabrication

By Novarc Innovation Team¹

With over 100 robotic deployments in high-mix welding environments and a decade-long commitment to engaging with welding fabrication, we have identified the top three challenges facing this industry: fitup variation, tack adaptation, and seam tracking. Adaptive welding technology that responds dynamically to live welding scenes, represents a crucial advancement that could address these challenges effectively. Unlike the current solution, which relies on pre-scanning and has been met with limited enthusiasm due to its significant preparation time and reliance on costly and scarce programming expertise, vision-based adaptive welding technology operates in real-time, mirroring the actions of skilled human welders. In essence, it fills welding robots with the perception and cognitive abilities of experienced welders, resulting in consistently high-quality welds.

Considering the pervasive development of AI, the core of the adaptive welding system must adeptly handle a wide array of welding conditions, encompassing various joint preparations, types, positions, thicknesses, materials, and more. Meeting this demand for training the AI core involves exploring a range of approaches, each with its own advantages and disadvantages. In our adaptive welding applications, we draw upon our experiences in implementing these solutions to address the complexities of the task at hand, ultimately providing effective solutions to the top challenges in welding.

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Mahyar is the Vice President of Innovation at Novarc Technologies, directing smart welding technologies using industry 4.0 platforms, machine learning, intelligent vision systems, digital twins, IIoT, and simulation tools for welding automation and autonomy. His industry-leading work has resulted in more than 110 published papers and significant awards from the International Institute of Welding, the Canadian Welding Bureau, The American Society of Mechanical Engineers, and Canada's Natural Sciences and Engineering Research Council. Mahyar has a Ph.D. in Computational Weld Mechanics and high-profile experience applying his knowledge to the automotive, aircraft, marine, medical devices, energy, oil & gas, and heavy machinery industries. He holds a Professional Engineering Licence, PMP certificate, IWE designation, ASME FFS, Digital Twins, and Machine Learning Certificates. He is also an adjunct professor in the Materials Department at the University of British Columbia, teaching a signature course on "Welding and Joining of Materials."