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Augmenting the workforce with immersive interfaces: An overview of industrial augmented reality and its uses in aiding manual assembly

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Augmented reality (AR) is a type of immersive interface that allows the placement of additional digital content within the user's field of view (FoV). Thus, when appropriately designed, it may provide dedicated on-the-job guidance and support the users in executing their tasks across various industrial contexts. By projecting spatial information and real-time guidance directly onto physical workpieces, the AR interface may help to mitigate the mental effort required to translate 2D documentation into real-world actions. In that context, after providing a brief overview and introduction to AR, the talk will outline empirical results from a direct comparison between immersive AR and more traditional industrial solutions that use touchscreen interfaces during manual assembly. The data indicate that while traditional methods may feel familiar and are superior for non-complex tasks, AR-driven systems significantly improve performance on the shop floor by reducing the frequency of assembly errors and shortening the time required for complex assembly tasks. The talk will further offer insights into the significant influence of the environment in which the AR interface is deployed, as well as discuss how users' biases shape the utilization of AR enhanced with computer vision-based error detection during the assembly process.

Dr. Slawomir Tadeja is a Postdoctoral Associate with the Department of Mechanical Engineering at the Massachusetts Institute of Technology (MIT), where he researches learning technologies for manufacturing education and workforce development. Broadly speaking, his work focuses on human-oriented cyber-physical systems and human augmentation technologies, such as extended reality (XR) interfaces, exoskeletons, and other wearables, applied in various industrial contexts. He holds a PhD from the Engineering Department at the University of Cambridge, where he also served as a Research Associate at the Institute for Manufacturing (IfM). He completed his undergraduate studies in Computer Science at the Jagiellonian University and undertook various internships and work placements, including CERN and ESA. Among other awards, this work received the ISMAR 2024 Best Journal Paper Honorable Mention for AR deployment in industrial settings. He is also the recipient of the Institute of Manufacturing (IfM) 2023 Postdoctoral Award for Excellence in Research and co-authored the Most Impactful Poster at MERE 2026 at MIT MechE.

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