

An Augmented Reality Intelligence Assisted Assembly System

Augmented Reality (AR) technology has recently made a great progress. Not only in entertainment and gaming industries, AR also has a good potential in many smart manufacturing applications. Manual assembly/disassembly is often involved in the maintenance of complex systems, such as semi-conductor equipment and aerospace products, and thus inducing human errors on the shop floor. Motivated by a research concept “AR is a collaboration interface between human and artificial intelligence,” we investigate augmented reality assisted assembly simultaneously from the aspects of enabling functions development, interface design, and ergonomic assessment. Firstly, a two-stage computational framework supported by 3D object recognition and tracking functions is proposed to automatically annotate assistive information with respect to the assembly features of real parts. Next, we propose an innovative idea of Intelligence Assistance that automatically adjust assisted functions and display information considering the user’s performance and learning effect during the assembly process. Validation tests will be conducted to show the effectiveness of this idea. Lastly, we plan to perform ergonomic assessments on AR head mounted display (HMD) devices. Our focus is to analyze and understand how the inefficiencies of these devices influence the human-machine interactions in AR from physical and mental assessment data. It is also advantageous to discover possible visual fatigue and mental workloads, and to propose their improvements. This research will strengthen the effectiveness of augmented reality technology on manual assembly and to provide design rules for AR assisted systems. The research outcomes may be applicable to other areas in smart manufacturing.

Keywords: Augmented Reality, Mechanical Assembly, 3D Recognition and Registration, Interface Design, Ergonomic Assessment