Practical Use Cases of Virtual/Mixed Reality in High-Investment Products Design, Training and Maintenance

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Abstract

In this work we introduce practical use cases of virtual/mixed reality (VR/MR) in high-investment products design, training and maintenance. Methods and practices of these cases could be exploited in space domain. VTT Technical Research Centre of Finland Ltd has already exploited VR/MR and participatory design for some 25 years in order to design and evaluate high-investment products (see Figure. 1). The main goal of using the VR/MR environment is to provide all designers and stake holders, including workers, a possibility to experience their future workplaces and/or influence their design.

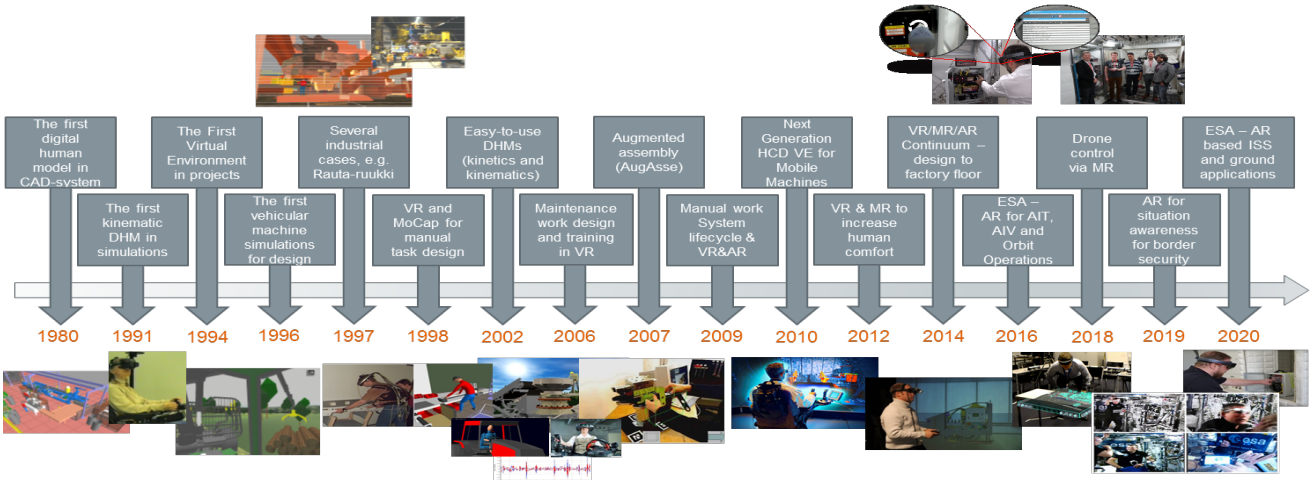

Figure 1. VTT's use cases of VR/MR in high-investment products design, training and maintenance from past 25 years

During these decades VR/MR/(AR) has been exploited in about 100 company cases, three of them has been in space domain (training, spacecraft assembly and remote operation). These cases have been part of research projects or they have been more straightforward assignments by the companies. The use of VR/MR and participatory design has provided clear value for the customer; for example, in a steel plant upgrade design, the customer's saving was over 100,000 euros. VTT helped the company achieve proper upgrade design, and thus avoid any costly design and installation revisions later on. Two well-known machine construction companies are currently using these laboratory services almost on a daily basis. In current research, the main development areas are (1) assembly and maintenance design, and (2) cabin design and visibility analysis for work machines.

The next step will be the digital twin, which can be used to virtually validate product performance, while also showing how your products are currently acting in the physical world. Digital twin provides a virtual-physical connection that lets user/operator analyze how a product performs under various conditions and make adjustments in the virtual world to ensure that the next physical product will perform exactly as planned in the field.

Note, as the work has been done in several projects and partners. Contributors of each case will be highlighted during presentation.