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Haptics and Virtual Reality in Modern Manufacturing



Saeid Nahavandi

Deakin University

Centre for Intelligent Systems Research

Geelong, Australia

Abstract Product assembly is one of the most studied processes in modern manufacturing. In recent years a number of computer based virtual reality systems have been proposed, developed and adopted by the manufacturing industries. Such systems have major advantages over conventional training practices for product assembly. Significant cost savings can be realized due to shorter training-scenario development times and reuse of existing engineering math models. In addition, the time span from the product design to full production can be shortened due to non-reliance on actual components and subsystems for training. Such training systems are effective if the knowledge required to be transferred is just process sequence such as assembly sequence. However, knowledge transfer for procedural and cognitive learning as well as skills development is very limited, due to the lack of user interactivity and immersion.

This talk will focus on a research technology platform where haptics and virtual reality are integrated to create an effective environment for production assembly operators' training. In this system virtual reality provides the grounds for realistic visualisation, as well as immersion, whereas haptics enforces physical constraints within the virtual world generating the feelings of realistic interaction, making it accessible for formal learning and better understanding during task performance.

The developed research technology platform imitates real physical training scenarios by providing comprehensive user interaction, constrained within the physical limitations of the real world. Through the utilisation of a haptics device, providing realistic force feedback, users are able to engage in product assembly training with a stronger sense of 'reality'.

About the Speaker: **Saeid Nahavandi** received his BSc (Hons), MSc and PhD in Control Engineering from Durham University, UK in 1985, 1986 and 1991 respectively.

Saeid is an Alfred Deakin Professor and the Director for the Centre for Intelligent Systems Research at Deakin University in Australia.

Professor Nahavandi is a Fellow member of IET, IEAust and Senior Member of IEEE and has published over 350 refereed papers and been awarded several competitive Australian Research Council (ARC) grants over the past five years. He received the Research collaboration / initiatives award from Japan (2000) and Prince & Princess of Wales Science Award in 1994. He won the title of Young Engineer of the Year Award in 1996 and holds two patents. In 2002 Professor Nahavandi served as a consultant to Jet Propulsion Lab (NASA) during his visit to JPL Labs. In 2006 he received the title of Alfred Deakin Professor, the highest honour at Deakin University for his contribution to fundamental research.

Professor Nahavandi is the founder for the Centre for Intelligent Systems Research with 55 full time researchers at Deakin University. He actively contributes and leads four major research projects in three Cooperative Research Centres with over 50 major international companies as partners. In modelling and simulation of complex systems he received awards from several organisations to focus on simulation based optimization of manufacturing processes, airport operations, logistics and distribution centres. He has carried out industry based research with several major international companies such as GM, Ford, Holden, Nissan, Bosch, Futuris, Boeing, Vestas just to name a few. For his contribution in haptics and robotics he won two major research grants from the Australian Department of Defence on haptically enabled counter explosive robot design.

Professor Nahavandi has been the chairman of six International conferences and the General Chair for World Manufacturing Congress series and the International Congress on Autonomous Intelligent Systems. He also holds the position of Editor for the International Journal Intelligent Automation and Soft Computing (South Pacific region), International Journal of Computational Intelligence and Associate Editor - IEEE Systems Journal, International Journal of Innovative Computing & Information Control.