

The 2018 VGTC Virtual Reality Technical Achievement Award



Gregory F. Welch

The 2018 Virtual Reality Technical Achievement Award goes to Gregory F. Welch of the University of Central Florida, USA, in recognition for his contributions to human motion tracking and to mixed reality applications in medicine and training. Professor Welch has been working in Virtual Reality and Augmented Reality for more than 25 years. His method for single-constraint-at-a-time tracking with continuous automatic calibration has been cited as the reason UNC Chapel Hill's HiBall tracking system was the fastest, lowest latency, most precise, and most accurate wide-area tracking system. Among his many publications, his "Introduction to the Kalman Filter" report has been cited over 8,000 times. Professor Welch co-developed the ideas and methods for unified image-based modeling and spatially immersive displays, Spatial Augmented Reality, and Shader Lamps. He later applied these methods to humanoid forms to achieve physical-virtual avatars, and groundbreaking patient simulators for training healthcare practitioners. The IEEE VGTC is pleased to award Gregory F. Welch the 2018 Virtual Reality Technical Achievement Award.

Professor Gregory F. Welch is the Florida Hospital Endowed Chair in Healthcare Simulation at the University of Central Florida (UCF) with appointments in the College of Nursing, Computer Science Department, and the Institute for Simulation & Training. He is also an adjunct professor in the Department of Computer Science at the University of North Carolina at Chapel Hill. In 1986 he received a B.S. degree in E.E.T from Purdue University (with *Highest Distinction*), and in 1996 a Ph.D. in Computer Science from UNC. Prior to UCF he was a research professor at UNC, worked on airborne electronic countermeasures at Northrop's Defense Systems Division, and the Voyager Spacecraft Project at NASA's Jet Propulsion Laboratory.

While working on his PhD at UNC in the 1990s Welch worked primarily on the HiBall tracking system. His method for single-constraint-at-a-time tracking comprises two insights. He realized that incremental tracking by fusing the lowest-level individual sensor measurements dramatically reduced estimate update latency and eliminated errors due to the commonly violated "simultaneity assumption." He also realized that detectable differences in motion dynamics between users and common error sources could be used to enable automatic and continuous system calibration during every-day use. In 2000 Nick England founded a company called HiBall Tracker, Inc. From 2000–2015 HTI manufactured and sold HiBall-3000/3100 units all over the world.

As the Florida Hospital Endowed Chair in Healthcare Simulation at UCF Professor Welch works with colleagues to develop new methods and systems for training nurses and physicians, and new healthcare technology more broadly. Among other things he is developing new patient simulators that can change appearance, sense touch, exhibit temperature, pulse, breathing, and other body sounds. Welch and his colleagues are presently focusing on pediatric simulators, as practitioners cannot train with real children. He is also developing novel AR-based systems for casualty training that include physical-virtual wounds and systems that immerse the trainee in the chaos of a battlefield or a trauma unit.



Gregory F. Welch
University of Central Florida
Award Recipient 2018

Professor Welch has co-authored more than 140 conference papers, journal articles, book chapters, and technical reports in these areas, and is a co-inventor on multiple patents. His previous awards include the "Long Lasting Impact Paper" award at the 15th IEEE International Symposium on Mixed and Augmented Reality (ISMAR 2016).

Professor Welch has served the community more than 25 years as co-chair of past VR and ISMAR conferences and related events, as program co-chair, international program committee member, and other organizing roles over the years. He co-founded the Emerging Display Technologies workshop series that ran from 2005–2008 at VR and SIGGRAPH, co-organized multiple Dagstuhl Seminars on VR-related topics, and with collaborators co-founded a Virtual and Augmented Reality for Good (VAR4Good) series of workshops. He is an associate editor for the journals *Presence: Teleoperators and Virtual Environments* and *Frontiers in Virtual Environments* and serves as a reviewer for international journals, conferences, and workshops.

AWARD INFORMATION

The IEEE VGTC Virtual Reality Technical Achievement Award was established in 2005. It is given every year to recognize an individual for a seminal technical achievement in virtual and augmented reality. VGTC members may nominate individuals for the Virtual Reality Technical Achievement Award by contacting the awards chair, Henry Fuchs, at vgtc-vr-awards@vgtc.org.