

Virtual Reality for Knee Surgery and Human Anatomy

Jim X. Chen, Ph.D.
Department of Computer Science
George Mason University

Abstract

I present an overview of several projects in the Visual Computing and Graphics Lab at George Mason University: Knee Surgery Assistance System, Knee Alignment System, Virtual Ear Surgery, and Virtual Human Anatomy.

We have implemented several virtual reality systems for medical applications: a knee surgery assistance system that includes generating patient-specific 3D knee models from patient's magnetic resonant images (MRIs), simulating knee motion on the patient-specific knee model, and visualizing biomechanical information on the model; a knee alignment system that includes measurement and assessment parameters for abnormal knee joints; a virtual ear surgery system that includes temporal bone construction, visualization, and virtual surgery; and a virtual human anatomy system that includes natural color human body with separated organs and labels. Our current research interest is on virtual surgeries related to knee joint problems.

Short Bio:

Jim X. Chen is Professor of Computer Science, and the director of the Visual Computing and Graphics Lab at George Mason University (GMU), Fairfax, Virginia. From 1990 to 1995, Jim was a research associate at the Institute for Simulation and Training, Orlando, Florida. In 1995, he received his Ph.D. from the University of Central Florida and joined the Computer Science Department at GMU. He received honorary professorships from Fudan University, Southwest Jiaotong University, Beijing Jiaotong University, Hoseo University, and the University of Electronic Science & Technology of China.

Jim is associate editor-in-chief of AIP/IEEE Computing in Science & Engineering (CiSE) and General Co-Chair of VRCAI2010. He served as associate editor-in-chief of International Journal of Virtual Reality between 2006 and 2008, general co-chair of Edutainment2008, general co-chair of IEEE VR2006, and guest editor for IEEE Computational Science & Engineering, CiSE, and PRESENCE. He has been an active reviewer/appraiser for NSF and other funding agencies. He is a senior member of IEEE and a professional member of ACM.

Jim's research interests include computer graphics, virtual reality, visualization, networking, and simulation. His research has been funded by Dynamic Animation Systems, Inc., Inova Fairfax Hospital (Virtual Knee Anatomy), National Science Foundation, Link Foundation, MGB Ltd., National Institutes of Health, US Department of Education, National Research Council, and US Department of Defense. His current research focuses are on Virtual Surgery and Geographical Information Systems. Jim has authored 4 books, edited 2 conference proceedings, published over 100 research papers, and acquired 3 patents. He guided 13 Ph.D. dissertations. Seven of his former Ph.D. students were started as professors at graduation.