Electrical & Computer Engineering Graduate Seminar
SPEAKER: Professor Tyler Bell, ECE University of Iowa
"Real-time, Accurate 3D Video Communications"
Thursday, December 6, 2018 3:30-4:20 PM Room 2217 SC

Abstract

Recent progress in 3D scanning has realized real-time, high-resolution 3D imaging systems. These systems can provide highly accurate surface measurements in real-time which has enabled applications within manufacturing, entertainment, robotics, biometric analysis, and more. Although they have proven beneficial, these systems can easily generate 1-2 Gbps of data. Methods of compressing the 3D data then become necessary to realize potential applications that require real-time 3D data communications, such as remote surgery, telemedicine, homeland security, and the digital arts. We have innovated several 3D range geometry compression methods which can accurately and efficiently encode floating-point 3D geometry information within the color channels of a regular 2D image. For example, compression ratios of approximately 935:1 versus the OBJ 3D file format can be achieved with 3D geometry reconstruction error rates of approximately 0.027%. Utilizing these innovations, we developed the Holostream technology to address the long-standing challenge of accurately transmitting 3D video over low-to-medium bandwidth (wireless) networks in real-time. Using our platform, high-quality 3D video and color texture data was wirelessly delivered to mobile devices using only 4.8-14 Mbps. The received photorealistic 3D video can then be manipulated and interacted with on mobile devices or within augmented and virtual reality environments. In this talk, I will introduce: (1) recent progress in high-resolution 3D imaging and (2) our innovations toward accurate and efficient 3D geometry encoding, including the Holostream platform. I will conclude by discussing potential future directions, particularly those related to real-time 3D communications for virtual reality and augmented reality.

Bio

Tyler Bell is an Assistant Professor of Electrical and Computer Engineering at the University of Iowa. He leads the Holo Reality Lab and is a faculty member of the Public Digital Arts (PDA) cluster. Tyler received his B.S. and M.S. degrees from Iowa State University (2012, 2014), where he received a Research Excellence Award, and he received his Ph.D. from Purdue University (2018). Tyler's research has been featured in numerous public media articles and was an Innovation of the Year finalist at the 2018 TechPoint Mira Awards. Tyler's current research interests include high-quality 3D video communications; high-speed, high-resolution 3D imaging; virtual reality and augmented reality; human computer interaction; 3D data and 3D video compression; and multimedia on mobile devices.