

A Quantitative Evaluation of Haptic Data Prediction Techniques over Best-Effort Network

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Abstract—Exchanging haptic information over best-effort networks such as the Internet presents challenges due to the extremely high sensitivity to network impairments, especially the simultaneous occurrence of time-varying network latency and packet loss. Subsequently, the haptic interaction experience is deteriorated along with a reduction in the fidelity. In this paper we present a new approach to mitigate the effects of network impairments, termed Trust Strategy Prediction. As well as evaluation of TSP in quantitative model is presented in terms of accuracy and smoothness of haptic updates and compared with two well-known techniques used in haptic data prediction: Dead Reckoning and velocity/yank Estimation with filtering mechanism.

Keyword—communication network, haptics, tele-operation, haptic predictive control, trust strategy prediction.



Tiam Hee Tee received the first class honour degree in computer and network technology from Northumbria University, UK in 2012. After receiving scholarship from Sunway University, he continues studying his master degree in computer science with major in tele-haptics and tele-robotics. He was a research assistant of Affective & Assistive Technology Research Centre at the Sunway University. His research interests focus in the area of tele-operation, network communication, and human-robot-interaction.



Dr. Kian Meng Yap received the Diploma in Electronic Technology from the Tunku Abdul Rahman University College (Malaysia) in 1997, the Master degree with distinction from the Queen's University Belfast in 2002. He obtained the Engineering Council Examination Part 1 & 2 in year 2000 and become member of IET. He obtained his Ph.D also from the Queen's University Belfast in 2008 on research into providing network Quality of Service (QoS) for haptic traffic over the Distributed Virtual Environment (DVE) in Human Computer Interface (HCI) environment. He is currently a member of IEEE. He has been employed at Sunway University in Malaysia since 2009 and is currently Senior Lecturer of the Department of Computer Science and Networked Systems at the Sunway University. He has spent 10 years working in the machine control system, telecommunications and computer networking industries. He is currently the principal investigator for the three projects that are supported by the Ministry of Higher Education (MoHE) and Sunway University Internal Grant respectively. His current research interests include distributed Haptics; human computer interaction (HCI); network architectures and protocols; computer and telecommunications networks; haptics for visually impaired children; quality of service (QoS) architectures; virtual reality; embedded system (Micro-controller); tele-robotics.



Professor Alan Marshall holds the chair in Communications Networks at the University of Liverpool where he is director of the Advanced Networks Group. He is a senior member of IEEE and a Fellow of the IET. He has spent over 24 years working in the Telecommunications and Defence Industries. He is visiting professor in network security at the University of Nice/CNRS, France, and Adjunct Professor for Research at Sunway University Malaysia. He has published over 200 scientific papers and holds a number of joint patents in the areas of communications and network security. He has formed a successful spin-out company Traffic Observation & Management (TOM) Ltd specialising in intrusion detection & prevention for wireless networks. His research interests include Network architectures and protocols; Mobile and Wireless networks; Network Security; high-speed packet switching, Quality of Service & Experience (QoS/QoE) architectures; and Distributed Haptics.



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