

## **IRT International Seminar**

Sponsored by IRT Education and Research Committee of  
Ritsumeikan University

Date **9/19 (Wednesday), 2007 15:30-17:00**

Place **Seminar Room of Mechanical Systems, East Wing 4F  
Biwako-Kusatsu Campus, Ritsumeikan University**

# **Optimal Movement Generation**

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There is ample evidence from biology suggesting that human and animal movements are optimized with respect to some physical criterion. In this seminar we describe several algorithms for generating optimal and suboptimal movements for humanoids and other diverse robotic structures. Various performance criteria, ranging from minimum torque to maximum stability, are considered in generating a range of motions, some involving contact, for structures with closed loops, redundant actuation, and even variable joint stiffnesses. We derive gradient-based optimization algorithms using techniques from Lie groups, and also propose principal component-based interpolation methods for generating suboptimal motions in real-time. Demonstrations are shown for a humanoid performing a variety of movements, from reaching, kicking, and lifting, to balancing in a dynamic environment, jumping, running, and emulating various natural human motions.

## **BIOGRAPHY**

Frank Chongwoo Park received his B.S. in Electrical Engineering and Computer Science from MIT in 1985, and Ph.D. in Applied Mathematics from Harvard University in 1991. From 1991 to 1995 he was an Assistant Professor of Mechanical and Aerospace Engineering at the University of California, Irvine. Since 1995 he has been at the School of Mechanical and Aerospace Engineering at Seoul National University, where he is currently full professor. His research interests are in robotics, mathematical systems theory, and related areas of applied mathematics. He received a best conference paper award from the Manufacturing Engineering Division of ASME in 1997, and is a 2007 IEEE Robotics and Automation Society Distinguished Lecturer. He currently serves as senior editor of the IEEE Transactions on Robotics, and is also an area editor of the forthcoming Springer-Verlag Handbook of Robotics.

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