Dancing with Robots: Expressivity in Natural & Artificial Systems

Amy LaViers, University of Illinois at Urbana-Champaign
12:30 pm Friday, November 9th
222 Bowen Hall

Animal movement encodes information that is meaningfully interpreted by other natural systems, counterparts in the environment, and this is a behavior that roboticists are trying to replicate in artificial systems. Yet, prevailing mathematical models for movement are continuous, e.g. Newton's models, while those for information are discrete, e.g., Shannon's models. This talk presents an information-theoretic measure for the capacity of motion complexity of articulated platforms (both natural and artificial) and shows that this measure is stagnant and unexpectedly limited in extant robotic systems spanning the last 15 years. The talk points out fundamental limitations on mechanization, leveraging known limits on computation and challenging the idea that human and robot motion are comparable. The proposed measure, applied to a variety of natural and artificial systems, shows trends in increasing capacity in both internal and external complexity for natural systems while artificial, robotic systems have increased significantly in the capacity of computational (internal) states but remained more or less constant in mechanical (external) state capacity. This work presents a way to analyze trends in animal behavior and shows that robots may not be capable of the same multi-faceted behavior in rich, dynamic environments as natural systems. The talk will also outline work that aims to develop more expressive robotic systems and highlight how embodied movement analysis – and dancing with robots – has facilitated this process.

Amy LaViers is an assistant professor in the Mechanical Science and Engineering Department at the University of Illinois at Urbana-Champaign (UIUC) and director of the Robotics, Automation, and Dance (RAD) Lab. She is the recipient of a 2015 DARPA Young Faculty Award (YFA) and 2017 Director's Fellowship. Her teaching has been recognized on UIUC's list of Teachers Ranked as Excellent, with Outstanding distinction. She is co-founder of AE Machines, a startup company that won Product Design of the Year at the 4th Revolution Awards in Chicago in 2017. She completed a two year Certification in Movement Analysis (CMA) in 2016 at the Laban/Bartenieff Institute of Movement Studies (LIMS). Prior to UIUC she held a position as an assistant professor in systems and information engineering at the University of Virginia. She completed her Ph.D. in electrical and computer engineering at Georgia Tech with a dissertation that included a live performance exploring stylized motion. Her research began in her undergraduate senior thesis at Princeton University where she earned a certificate in dance and a degree in mechanical and aerospace engineering.

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