

ICRA15 Workshop on Dynamic Locomotion and Balancing of Humanoids: State of the Art and Challenges

Invited speaker: Prof. Art Kuo, Dept. of Mechanical Engineering, University of Michigan.



Title: Control of Dynamic Bipedal Locomotion

As the functionality of bipedal robots improves, their locomotion has become faster, more agile, and human-like. Trends in robot locomotion also point to smaller feet, to allow for placement on smaller footholds or uneven terrain, and to more degrees of freedom, which will allow for significant motions separate from the action of the legs. Many such trends also suggest that robots will have less control of their center of mass (COM), and may indeed be underactuated at points in the gait cycle. Higher speeds also imply a greater role for momentum in the nominal gait and in the possible corrections made for balance. But dynamic and underactuated motions also imply greater challenges for control. Here we will discuss trade-offs in control associated with more dynamic motions, and the role of the dynamics of the limbs and body for stability and balance. We will discuss how humans use active and passive dynamics, and leverage their many degrees of freedom to execute complex locomotion tasks. Finally, we will discuss potential cases where robots may benefit from emulating humans for locomotion.