ME Faculty Colloquium

Data augmented control of visual autonomous systems

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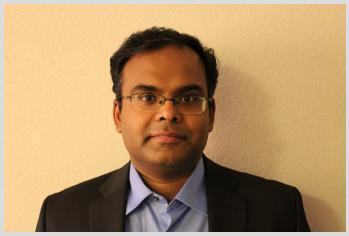
ABSTRACT

Vision-enabled robotic systems offer the promise of enhancing and redefining a variety of industries including automated package delivery and manufacturing. While these systems are beginning to be deployed in controlled settings for a variety of applications, their large-scale deployment across a range of diverse environments still eludes us. Satisfaction of performance guarantees is paramount to facilitate this transition. To this end, two data-driven strategies based on bioinspired learning are presented for endowing robotic systems with the ability to make rapid control decisions using noisy sensory data in uncertain and dynamic environments. First, insect-inspired visual processing techniques are combined with traditional control theoretic tools for the synthesis of novel nonlinear closed loop systems for ensuring safe collision-free navigation in challenging environments. Second, an alternative solution based on the recurrent neural network is presented for rapid and precise determination of necessary motion cues from visual data, which is the key to automated manufacturing applications. Extensive numerical and experimental tests on aerial and ground systems are used to demonstrate the efficacy of the proposed schemes. These results and their implications for the realization of autonomous systems suitable for real-world applications will be discussed.

ABOUT THE SPEAKER

Dr. Jishnu Keshavan is an Assistant Professor in Mechanical Engineering at IISc. His research interests are broadly in the areas of dynamical systems theory, nonlinear dynamics and control, and autonomous vision. He obtained a PhD (2012) and a MS (2007) in Aerospace Engineering from University of Maryland, College Park, and a BTech in Aerospace Engineering (2004) from IIT Bombay.



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