ME Seminar

Unconventional Mobility and Sensing in Bioinspired Swimming

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ABSTRACT

The concept of passive locomotion or dynamics, one that is achieved with no or minimal actuation, has been known to underpin the locomotion of a variety of animals. Essentially some (or all) degrees of freedom of a mobile body are unactuated and their dynamics are significantly determined by the environmental forces. Many species of fish can sense the ambient flow field and extract energy from it to improve their efficiency and agility. It would seem that some ability to sense and swim well is embodied in the morphology of their bodies and understanding the mechanics of this will enable engineers to design better swimming robots. This talk will describe a simplified model for fish-like swimming based on a well known terrestrial nonholonomic system, and use this model to show how passive degrees of freedom in a mechanical swimmer can bestow it improved agility. Swimmers with passive tails can manipulate the vortex wake around them in a manner that can aid their ability to turn. Even more interestingly the motion of passive tail-like appendages can encode information about the ambient flow field and the objects in it. Machine learning techniques can be applied on such kinematic information to classify the features of the flow and the talk will describe some experimental results on this theme.

ABOUT THE SPEAKER

Phanindra Tallapragada is an associate professor of mechanical engineering at Clemson University. He obtained his Ph.D in Engineering Mechanics from Virginia Tech in 2010 and did post doctoral research at the University of North Carolina Charlotte. Earlier he obtained his B.Tech and M.Tech in Civil Engineering from the Indian Institute of Technology, Kharagpur. He joined Clemson University as an assistant professor in 2013. His research interests are in dynamical systems and bioinspired locomotion related to terrestrial motion, fish-like swimming and low Reynolds number swimming.

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