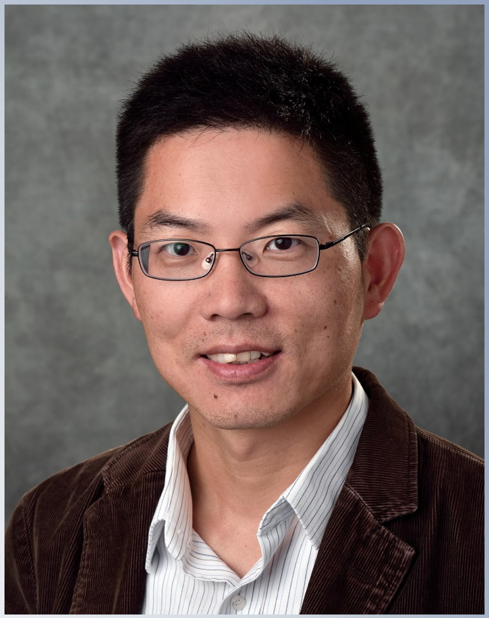
Gliding Robotic Fish: Make "Sense" of the Underwater World

Tuesday, September 26th @ 4 PM Room: BB W250



Dr. Xiaobo Tan is an MSU Foundation Professor in the Department of Electrical and Computer Engineering and Department of Mechanical Engineering (by courtesy) at Michigan State University (MSU). He received his bachelor's and master's degrees in automatic control from Tsinghua University, China, in 1995 and 1998, respectively, and his Ph.D. degree in electrical and computer engineering from the University of Maryland, College Park, in 2002. He was a postdoc with Institute for Systems Research at University of Maryland before joining the faculty at MSU in 2004. His research interests include bio-inspired underwater robots and their application to environmental sensing, electroactive polymer sensors and actuators, modeling and control of systems with hysteresis, and soft robotics. He has published over 200 journal and conference papers and holds two US patents on these topics. Dr. Tan has served on the editorial boards of Automatica, IEEE/ASME Transactions on Mechatronics, and International Journal of Advanced Robotic Systems. He has also been a Guest Editor for special issues or focused sections for five journals. Dr. Tan is keen to integrate his research with educational and outreach activities, and has served as Director of an NSF-funded Research Experiences for Teachers (RET) Site program at MSU from 2009 - 2016 and Curator of a robotic fish exhibit at MSU Museum in 2016. Dr. Tan is a Fellow of IEEE, and a recipient of the NSF CAREER Award (2006), MSU Teacher-Scholar Award (2010), and several Best Paper Awards.

Abstract:

Autonomous robots are playing an increasingly important role in surveying and monitoring underwater environments. In this talk I will present a new type of underwater robots, termed gliding robotic fish, which adopts the salient features of both underwater gliders and robotic fish. Like underwater gliders, it is capable of energy-efficient gliding; on the other hand, it can swim and maneuver with an actively controlled tail fin. In particular, I will focus on how the tail is used in concert with the gliding mechanism to realize novel, energy-efficient spiral motion in the three-dimensional space, a useful application of which is the sampling of water columns. Modeling and feedback control of the spiral motion will be discussed, along with experimental results from sampling harmful algae distribution in Wintergreen Lake, Michigan. Finally, I will briefly discuss our ongoing effort towards using gliding robotic fish to track the movement of fish species of interest in the Great Lakes.

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