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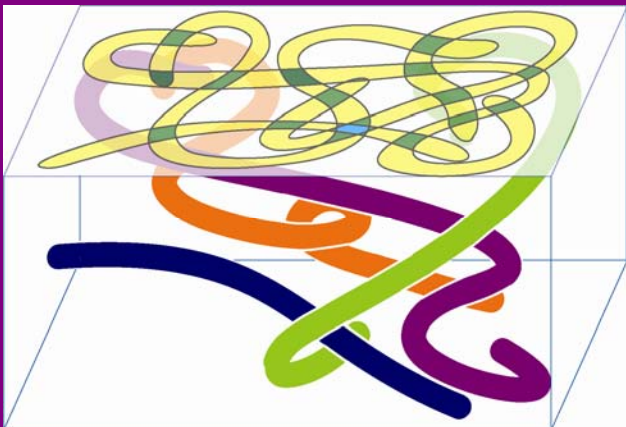
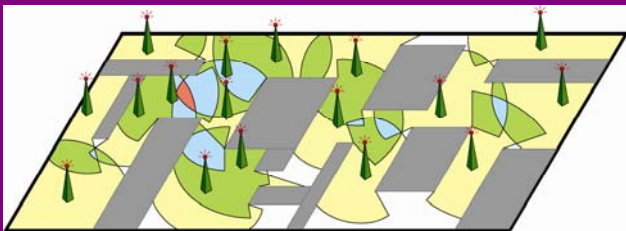
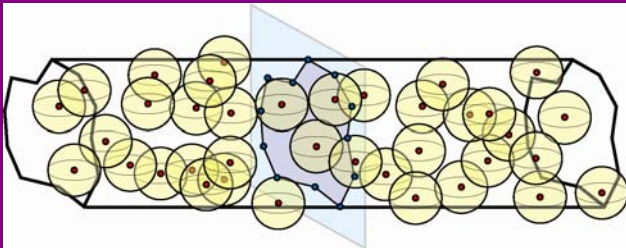
ROBOT SWARMS AND THE TOPOLOGY OF COORDINATION

Speaker: Professor Robert Ghrist
University of Illinois -
Urbana-Champaign

Date: Tuesday, 26 June 2007

Time: 6.30 pm - 7.30 pm

Venue: LT31, Faculty of Science
Block S16, Science Drive 1
National University of Singapore
Singapore 117543



ABSTRACT

The ability to fabricate increasingly smaller and cheaper sensing and actuation devices portends a future in which swarms of robots provide critical services, including search-and-rescue at disaster sites, environmental monitoring, and border security. But as individual robots and sensors shrink in size and cost, they multiply in number, requiring methods of coordination. One of the most fundamental and challenging problems is moving from local information (at the level of individual robots) to a global understanding of an environment (at the level of the full swarm). A century ago, mathematicians invented a new field --- "topology," the study of abstract spaces --- to handle very similar issues of passing from local to global. A century of subsequent work has yielded a dizzying array of elegant algebraic tools which have remained largely hidden within Mathematics. This talk will illustrate several surprising applications of this once-esoteric mathematical subject to the understanding and control of robot and sensor swarms.

ABOUT THE SPEAKER



Robert Ghrist is a Professor of Mathematics at the University of Illinois, Urbana-Champaign, with Research Professor appointments at that university's Coordinated Science Laboratory and the Information Trust Institute. Prof. Ghrist is also a founding member of CAESAR, the Center for Autonomous Engineering Systems And Robotics at the University of Illinois.

Professor Ghrist's research covers a broad array of topological methods in applied mathematics. These include applications of knot and braid theory in differential equations, applications of contact topology in fluid dynamics, applications of geometric group theory in robotics, and applications of algebraic topology in sensor networks.

Professor Ghrist has an undergraduate degree in Mechanical Engineering from the University of Toledo (BS 1991, valedictorian) and graduate degrees in Applied Mathematics from Cornell University (MS 1994, PhD 1995). Professor Ghrist held postdoctoral appointments at the Institute for Advanced Studies (Princeton) and the University of Texas (Austin), followed by assistant and associate professorships at the Georgia Institute of Technology and the University of Illinois. Professor Ghrist is the recipient of the National Science Foundation CAREER award and was awarded the Presidential Early Career Award for Scientists and Engineers by President G. W. Bush in 2004. Professor Ghrist was named a University Scholar by the University of Illinois in 2007.

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