MECHANICAL ENGINEERING **SEMINAR**

Robot Kinematics and Numerical Algebraic Geometry

Dr. Charles Wampler
General Motors R&D

Kinematics underlies applications ranging from the design and control of mechanical devices, especially robots, to biomechanical motion analysis to methods of predicting protein folding and nanosphere clustering.

This talk will discuss how problems in robot and mechanism kinematics can be formulated as systems of polynomial equations, which can be solved using algorithms from numerical algebraic geometry. A summary of the main algorithms of the field will indicate their broad applicability, while examples from kinematics demonstrate their effectiveness. Problems that can be addressed include robot forward and inverse kinematics, mechanism design problems, and analysis of robot workspaces. Examples to be discussed in this talk will include some that illustrate subtle phenomena not always handled well by less robust methods. Finally, we will have a brief look at the Bertini software package co-authored by the presenter.

Charles Wampler has degrees in Mechanical Engineering from MIT (B.S. '79) and Stanford University (M.S. '80, Ph.D. '85). He is a Technical Fellow at General Motors R&D, where he has been employed since 1985. In addition to 90 publications, including two books on solving polynomial systems, he has 25 patents, with contributions to humanoid robotics and to flexible automation for automobile manufacture. He was part of the NASA/GM team that built Robonaut 2, a humanoid currently residing on the International Space Station. Charles is a Fellow of ASME and IEEE.

Friday: November 22, 2013

11:00am in 227 Mudd

Lunch served after in ME lobby