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Title: Geometric nonlinear control and applications

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Abstract: A control system can be seen as a family of dynamical systems (or vector fields) parameterized by the control. In this scenario, differential geometry comes into play, since the qualitative properties of a control system depend on the properties of vector fields and interactions between them and the basic tool to understand such interactions is their Lie bracket. Most mechanical systems have configuration spaces with components that are Lie groups or symmetric spaces. As a consequence, methods and results that rely on techniques from differential and Riemannian geometry can be applied to a large class of mechanical control systems and find applications in robotics and other engineering areas. In this presentation we will be guided through several concepts and results in geometric nonlinear control using the most classical of all nonholonomic mechanical systems, the rolling sphere.