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Stuart Marcus Rogers* (smr1@ualberta.ca), CAB 632, University of Alberta, Edmonton, AB T6G 2G1, Canada, and **Vakhtang Putkaradze** (putkarad@ualberta.ca), CAB 632, University of Alberta, Edmonton, AB T6G 2G1, Canada. *Optimal Control of a Nonholonomic Mechanical System.*

This talk investigates the optimal control of a mechanical system with nonholonomic constraints. Suslov's problem is an algebraically simple and classical example of a nonholonomic mechanical system. This mechanical system considers the motion of a rigid body rotating about a fixed point subject to the constraint $\Omega(t) \cdot \xi(t) = 0$, where $\Omega(t)$ denotes the rigid body's angular velocity and $\xi(t)$ is a prescribed time-varying vector, both expressed in the rigid body's body frame. First, the pure equations of motion of this nonholonomic mechanical system are derived. Next, letting $\xi(t)$ serve as the control, the optimally controlled equations of motion are derived that obey the pure equations of motion, satisfy prescribed initial and terminal boundary conditions, and minimize the time integral of a prescribed cost function $C(t, \Omega(t), \dot{\Omega}(t), \xi(t), \dot{\xi}(t))$. Finally, numerical solutions of the optimally controlled equations of motion are presented. (Received September 12, 2016)