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J Zimmerman* (anj.sci@gmail.com). *Euclidean and non-Euclidean rolling sphere problems.*

The Euclidean rolling sphere problem is extended to non-Euclidean situations in which an n -sphere (n -hyperboloid) rolls on another n -sphere (n -hyperboloid) of different radius. The notion of rolling is defined in an isometric sense: the orientation of the rolling object is defined by an element in its isometry group. These rolling problems are formulated as left-invariant optimal control problems whose Hamiltonian equations reveal that on the level of Lie algebras the extremal equations are all governed by a single set of equations, and that the projections onto the stationary manifold corresponding to $I_4 = 0$, where I_4 is an integral of motion, coincide with elastic curves. (Received January 25, 2008)