BROCKETT'S PRODUCT OF EXPONENTIALS FORMULA

KINEMATICS
Screw motion parametrized as a space trajectory with constant strain

$$g_j'(X) = g_j(X)\hat{\bar{\xi}}_j$$

$\int$

EXPONENTIAL MAP
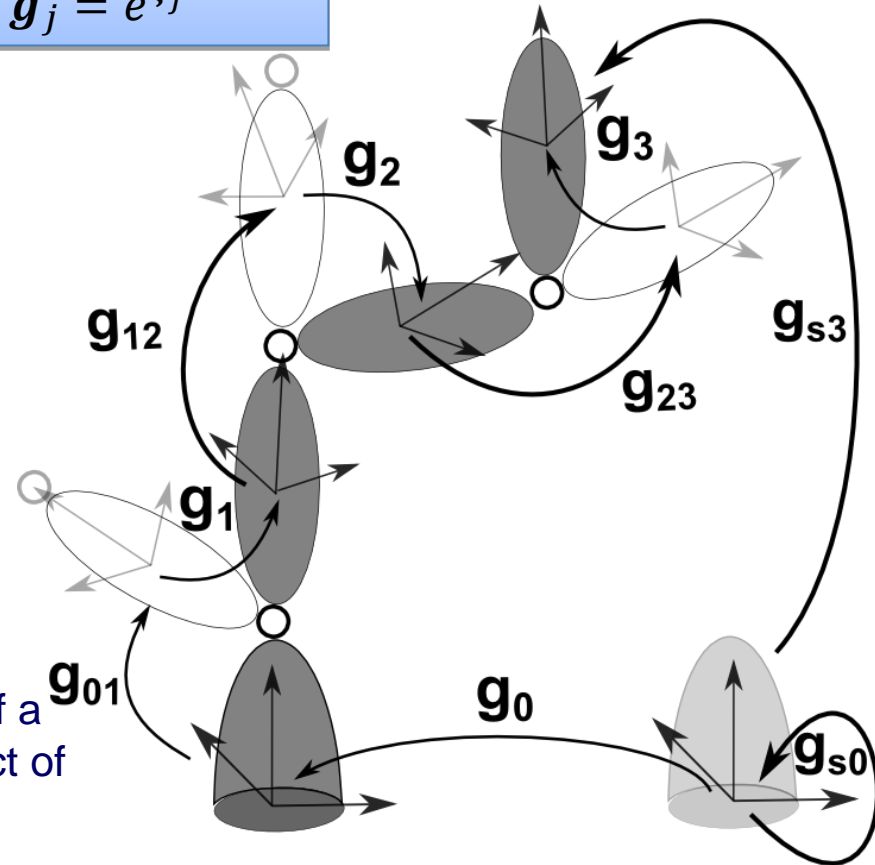We follow the trajectory up to X=1

$$g_j = e^{\hat{\bar{\xi}}_j}$$

JOINT TWIST
A joint twist belongs to a subspace of $\mathfrak{se}(3)$

$$\xi_j = B_j q_j$$

POE FORMULA
Twist are expressed in the body frame

$$g_{sj} = g_{s0}e^{\hat{\bar{\xi}}_0}g_{01}e^{\hat{\bar{\xi}}_1}\cdots g_{ij}e^{\hat{\bar{\xi}}_j}$$

- Thanks to the exponential map the configuration of a multi-body system can be represented by a product of exponentials

- R. W. Brockett. Robotic manipulators and the product of exponentials formula. In *Mathematical Theory of Networks and Systems*, pages 120–129. Springer Berlin Heidelberg, 1984.
- R.M. Murray, Z. Li, and S.S. Sastry. *A Mathematical Introduction to Robotic Manipulation*. Taylor & Francis, 1994.