

## Test Cases for Dynamics.py

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**Date: 11/5/18**

1. Test\_zero\_torque\_rates\_ideal\_q: The disturbance and control torque are zero. Arbitrary position and velocity is set. Initial quaternion is  $[1,0,0,0]$  and angular rates are zero. Then  $\dot{q}$  and  $\dot{w}$  are zero.
2. Test\_zero\_torque\_ideal\_q: The disturbance and control torque are zero. Arbitrary position and velocity is set. Initial quaternion is  $[1,0,0,0]$  and angular rates are arbitrary. Then  $\dot{q}$  is  $[0, w]$ .
3. Test\_inertia\_eigenvect: Set angular velocity as eigenvector of inertia matrix. Set all torques to zero. Then  $\dot{w}$  is zero.
4. Test\_kinematics\_explicitly: The quaternion is set to be  $[0.4, 0.254, -0.508, 0.719319]$  and the angular velocity to be  $[0.1, -0.05, -0.3]$ . The explicit  $\dot{q}$  is calculated to be  $[0.082498, 0.114183, 0.064066, -0.04095]$ . This is independent of disturbances.