ROTATION DRIFT BENCHMARK

Reference No / Version	RAL-SI-2020-B19-0838_4-V1.0 For the latest versions of the benchmark, please refer to http://newdexterity.org/benchmarking/
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Adopted Protocol	Any protocol that involves periodic object rotation (RAL-SI-2020-P19-0838_2-V1.0, RAL-SI-2020-P19-0838_3-V1.0, RAL-SI-2020-P19-0838_4-V1.0).
Scoring	Assessment is based on the average quaternion between cycle endpoints $\bar{\mathbf{q}}$ obtained through the following steps. For each recorded periodic manipulation motion: 1) Isolate motion end points. 2) Compute rotation differences between subsequent endpoints as a sequence of quaternions $\mathbf{q}_i$. 3) Compute the average quaternion $\bar{\mathbf{q}}$ as the eigenvector corresponding to the largest eigenvalue of matrix $\mathbf{M} = \sum_{i=1}^{n-1} (\mathbf{q}_{i+1} \times \text{inv}(\mathbf{q}_i)) (\mathbf{q}_{i+1} \times \text{inv}(\mathbf{q}_i))^T$, where $\mathbf{q}_i$ is the quaternion orientation for endpoint i. 4) Compute the angular offset of the average quaternion: $\bar{\theta} = 2\cos^{-1}(a)$, where a is the scalar part of the average quaternion $\bar{\mathbf{q}}$. The resulting angle corresponds to an average drift angle for a specific manipulation motion. If different objects are used, the steps are repeated for each instance.
Details of Setup	To assist with data processing and drift vector computation, code samples are provided.
Results to Submit	For each sensorized object and manipulation motion: • Sensorized object type, size, and surface. • Sensorized object mass and center of mass (internal weight configuration). • Assessed hand model, aperture and control details. • Computed drift angle of the average rotation offset $\bar{\theta}$. • Plots of recorded point clouds with highlighted end points. • Comments on obtained results with respect to the hand model and control.