# TRANSLATION REPEATABILITY BENCHMARK

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| Reference No / Version | B-TR-0.01 |
| Authors | Gal Gorjup |
| Institution | University of Auckland |
| Contact Information | ggor290@aucklanduni.ac.nz |
| Adopted Protocol | Any protocol that involves periodic object translation (P-IHT-0.01, P-GT-0.01, P-GR-0.01). |
| Scoring | Assessment is based on the cycle end point variation. For each recorded periodic manipulation motion: <br> 1) Isolate motion cycle start and end points. <br> 2) Compute the mean drift vector (Benchmark B-TD-0.01) and subtract it from subsequent endpoints to eliminate drift. <br> 3) Compute covariance matrix of the end points. <br> 4) Perform eigenvalue decomposition on the covariance matrix and extract the largest eigenvalue $\lambda_{max}$. <br> 5) Compute the square root of the largest eigenvalue $\sqrt{\lambda_{max}}$. <br><br> The result $\sqrt{\lambda_{max}}$ corresponds to the standard deviation along the dominant principal component and characterizes the largest spread of the manipulation motion end points. A lower score corresponds to better repeatability. The computation is performed for every sensorized object. |
| Details of Setup | To assist with data processing and metric computation, code samples are provided. |
| Results to Submit | For each sensorized object and manipulation motion: <br> • Assessed hand model and control details. <br> • Computed $\sqrt{\lambda_{max}}$. <br> • Plots of recorded point clouds with appropriately offset and highlighted end points. <br> • Comments on obtained results with respect to the hand model and control. |