

MATLAB CODES: SCALING-ROTATION DISTANCE AND INTERPOLATION OF SYMMETRIC POSITIVE-DEFINITE MATRICES*

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List of core Matlab functions .

1. `dist = scrotdist(X,Y)` : Compute the scaling-rotation distance $d_{\mathcal{SR}}(X, Y)$. This function works for $p = 2, 3$.
2. `[dist, params] = MSRcurve(X,Y)`: Return the distance and the parameters (U, D, A, L) of the minimal scaling-rotation (MSR) curve. This function works for $p = 2, 3$.
3. `[U,D] = pickaversion(X)`: For an SPD matrix X , pick a version (or an eigen-decomposition) of X .
4. `[T, dist, Uarray, Darray]= scrotcurve(U,D,V,Lambda)`: Provides
 - (a) `Uarray, Darray`: discrete evaluations of the geodesic γ between (U, D) and (V, Λ)
 - (b) `T`: discrete evaluations of the corresponding SPD matrices $\chi \equiv c \circ \gamma$, in a vectored form.
 - (c) `dist`: Returns the geodesic distance between (U, D) and (V, Λ) .

List of Matlab functions for Visualization.

1. `plotellipse(X)` : Plot the ellipse corresponding to a 2×2 SPD matrix X .
2. `plotellipsoid(X)` : Plot the ellipsoid corresponding to a 3×3 SPD matrix X .
3. `drawscrotcurve(X,Y)`: Visualize an MSR curve from X to Y , by a discrete sequence of the evaluated MSR curve, showing the corresponding ellipse (if $p = 2$) or ellipsoid (if $p = 3$). This function works for $p = 2, 3$.
4. `condpd2a` : Plot the boundary of the set of 2×2 SPD matrices.

List of auxiliary Matlab functions. `optver`, `FA`, `permutematrix`, `signchangematrix`, `vecd`, `matd`, `SQcurve`, `quat2rot`, `rot2quat`.

Example.

```
X = diag([15,5,1]);
Y = diag([9,12,8]);
dist = scrotdist(X,Y)
[~, paramsscrot]=MSRcurve(X,Y);
[~,~,Uarray,Darray,~,~]= scrotcurve(paramsscrot.U,paramsscrot.D,paramsscrot.V,paramsscrot.Lambda);
figure;clf;
drawscrotcurve(X,Y);
```

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