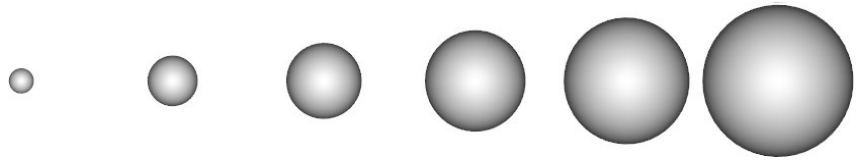
Part 1 Introduction

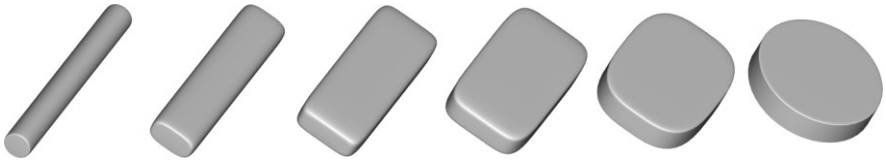
1 Tensor has three intrinsic properties, i.e., scale + shape + orientation

2 Glyph visualization:

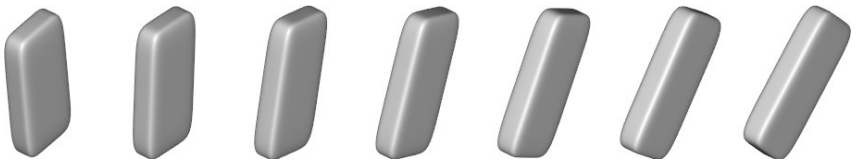
$$G(\mathbf{D}) = s(\mathrm{tr}(\mathbf{D}))\,\mathbf{R}\tilde{\Lambda}B\left(\tilde{\lambda}_j\right)$$



(a) Spherical tensor with varying scale alone



(b) Tensors with gradually varying shape alone



(c) Tensors with gradually varying orientation alone

Fig 1 Tensor three intrinsic properties

3 The task is to analyze a group of diffusion tensors.

There are two types of analysis &visualization (demo) approaches.

- Euclidean Mean + 4th-order Covariance Tensor/Eigen-tensor + Invariant Gradients and Rotation Tangents decomposition

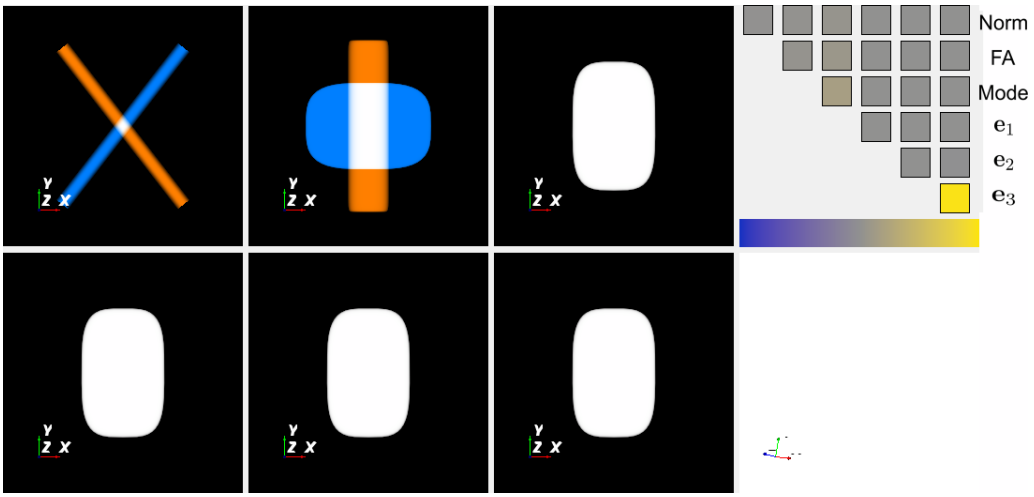


Figure 2 Screenshot of Covariance-based Visualization

- Our mean tensor glyph (encode each tensor property separately) and mean dODF glyph (directly model the diffusion PDF)

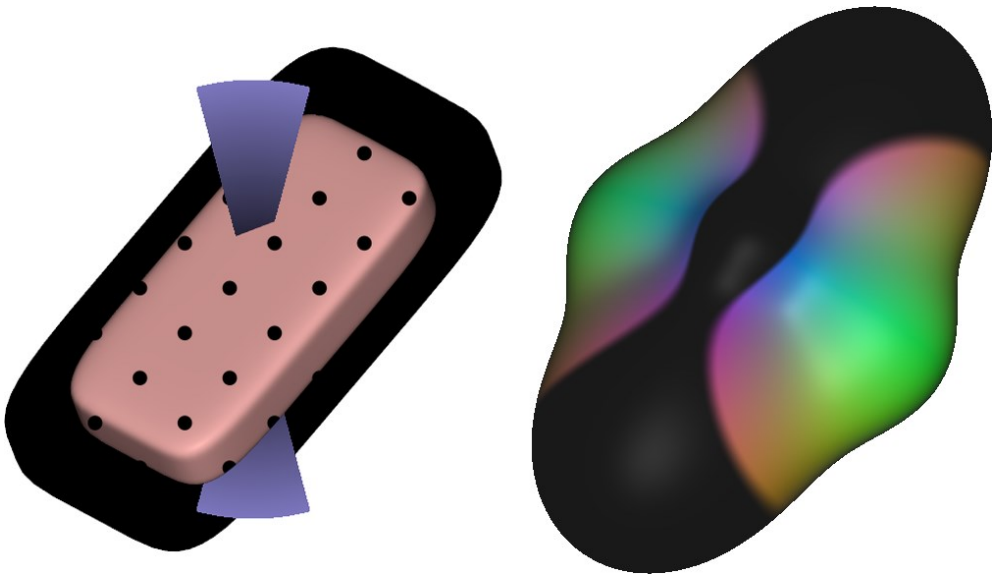
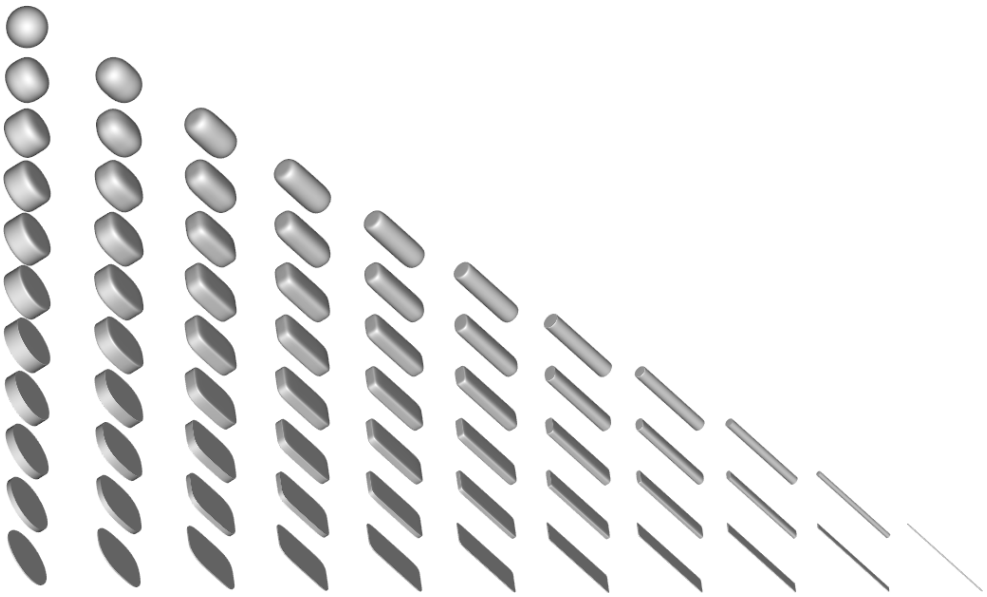


Figure 3 Our tensor variation glyph and dODF glyph

Part 2 Ensemble Exploration

Name: Task: Visualization:

(1) What tensor shapes do you think are present in the ensemble? Mark them on the triangle.



(2) Is scale varying in this ensemble?

☐Yes ☐No ☐Don't know

(3) Describe the orientation variations.

☐No variation ☐Yes, there is ☐ Don't know

Could you also tell the major direction(s) that has/have large diffusion variations?

(4) Is there a correlation between

☐No correlation

☐scale-orientation

☐scale-shape

☐shape-orientation

☐scale-shape-orientation

☐Don’t know

Part 3 Open Questions

(1) How useful do you think is way to analyze a group of tensors in scale, shape, and orientation separately (i.e., derive the mean and quantify the variations)?

☐Very ☐ Moderately ☐Slightly ☐Not at all

(2) How intuitive is our glyph design? Is

☐Very ☐ Moderately ☐Slightly ☐Not at all

(3) How useful do you think the information provided by dODF?

☐Very ☐ Moderately ☐Slightly ☐Not at all

(4) Which visualization do you prefer for analyzing the tensor ensemble?
Could you shortly state why?

☐Neither ☐Covariance Tensor ☐Our Method ☐Both

The comparison of visualization for three synthetic ensembles: