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Interactive fibre structure visualization of the heart.

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Summary: The heart consists of densely packed muscle fibres. The orientation of these fibres can be acquired by using Diffusion Tensor Imaging (DTI) ex vivo. A good way to visualize the fibre structure in a cross section of the heart is by showing short line segments originating from the cross section and aligned with the local direction of the fibres. If the line segments are placed dense enough, one can see how the fibre orientations change. However, generation of the line segments takes time and thus the user has to wait for new geometry to be generated when the plane defining the cross section is changed. We present a new direct rendering method for the visualization of the 3D vector field in a 2D user-definable cross section of a heart. On the intersection of the plane with the vector field, the full 3D vectors are rendered as 3D line segments with a local ray casting approach. No preprocessing of the data is needed and no geometry is generated. This technique allows a fast inspection of the data to identify interesting areas where further analysis is necessary (e.g. quantification or generation of streamlines). We also show how the technique is generalized to other glyph shapes than line segments by implementing ellipsoids.

Keywords: diffusion tensor imaging; heart visualization; glyphs; GPU based
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