Alaleh's part regarding Spherical color mappings

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[Needs to be merged with Zihan's text about scalar color maps] There are two categories of color mapping methods:

- Scalar Color Mapping: Consider a scalar value associated with each segment of a tract, which could be FA or MD in this context. This type of color mappings provide a mapping from the chosen scalar quantity to a color.

- Spherical Color Mapping: Unlike scalar color mapping, this type of mapping is usually from an inherent property of the tract segments to a color. A common choice is the orientation of the line segment.

In this report, we examine 5 scalar and two spherical color mappings. The scalar color mappings are *[Zihan's descriptions]*. The spherical color mappings are

- Absolute value method [cite] is a commonly used color mapping which maps the major axes, i.e. *[the anatomical names]*, to major color components Red, Greed and Blue. The mapping is defined as *[we need to choose the symbols and names]*

$$f(\mathbf{s}) = [|s_x|,\ |s_y|,\ |s_z|]^T \tag{1}$$

  where $\mathbf{s} = [s_x, s_y, s_z]^T$ is the normalized vector corresponding to a line segment.

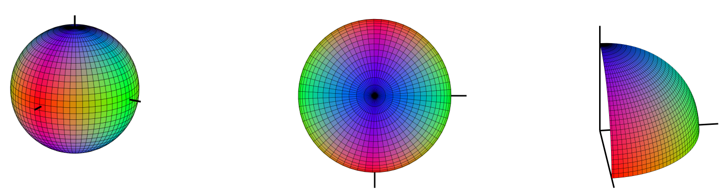

Figure 1: Absolute value method, colored sphere.

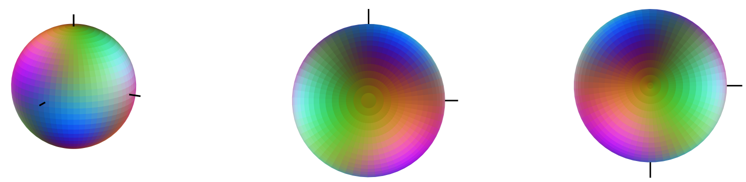

Figure 2: Boy's surface method, colored sphere.

- Boy's surface method [cite] [*complete the name*] is a more complicated color mapping scheme based on the immersion of Real Projective Plane in $\mathbb{R}^2$. The mapping is defined as

  $$f(\mathbf{s}) = [f_1(\mathbf{s}), f_2(\mathbf{s}), f_3(\mathbf{s})]^T \tag{2}$$

  where

  $$f_i(\mathbf{s}) = \sum_{j=0}^{\infty} c_{i,j} h_j(\mathbf{s}). \tag{3}$$

  The functions h_j are the spherical harmonics, a similar concept to harmonics in Fourier analysis. As suggested by the authors in [cite], the summation is replaced with a partial sum to obtain a continuous mapping and the coefficients $c_{i,j}$ are adjusted manually for better results.