Abstract

Geodesics and hyperstreamlines are used to visualize second order tensors. We further look at a new way of visualizing second order tensor fields. By using the direction of geodesic curves in stead of eigenvectors, we make a different approach to so called integration methods. We extend the concept to include tensors which are not necessarily the metric.

Keywords: Tensor Field Visualization, Hyperstreamlines, Geodesics

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This thesis uses extensively the programming language Python. For the sake of reproducibility, here we list the versions of the packages and sub-packages that are used throughout the thesis.

- Python - v.2.7.9
  - NumPy - v.1.8.2
  - SciPy - v.0.16.0
  - Matplotlib - v.1.4.2
  - SymPy - v.0.7.7.dev
- IPython - v.2.3.0

For SymPy, instead of using a stable release[1], we were required to use the latest developer version due to bugs that were present in the current release[2].

This may seem like a strange thing to do, but I would like to acknowledge the following. A high-level language like Python has made this thesis a very fun and interesting task. Instead of bogging down into details, Python has given me the leverage required to focus on other aspects of the coding; where you are no longer required to exhibit strenuous efforts to locate bugs and errors. Instead it allows the coder to focus efforts in quickly writing down the mathematical or physical problem with relative ease, and visualising the results in a similar quick manner. The best part in all of this is that every package and sub-package used to achieve the results are free and available online. Therefore, I am grateful to every person who has contributed in making Python into the powerful mathematical tool that it has now become.

Last but not least, I am grateful to all my supervisors for their support and encouragement. Frankly, I am befuddled that they managed to put up with my constant queries. In this regard, to more than any, I am grateful to Professor Øyvind Andreassen.

[1] https://github.com/sympy/sympy/releases

[2] https://github.com/sympy/sympy/releases/tag/sympy-0.7.6.1