

How to Write a Visualization Research Paper: The Art and Mechanics

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Introduction (Motivation)

“Give a man a fish. You have fed him for today. Teach a man to fish, and you have fed him for a lifetime.”—Lao Tzu

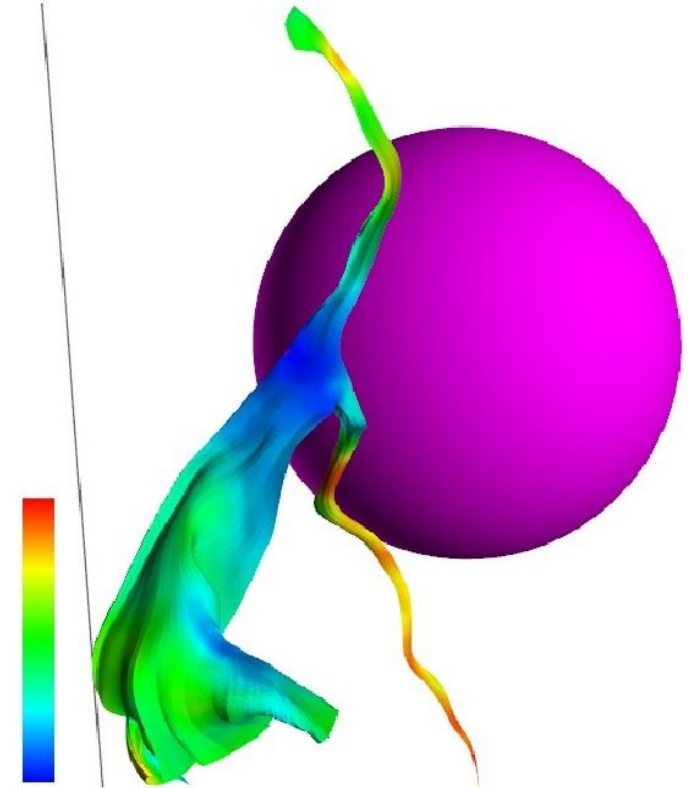
(Chinese proverb).

- Meant to serve as a **starting point** for those new to writing research papers
- Writing papers is a difficult task, but we still demand it. Guidelines and instructions are generally absent (for visualization)
- No substitute for experience or an advisor



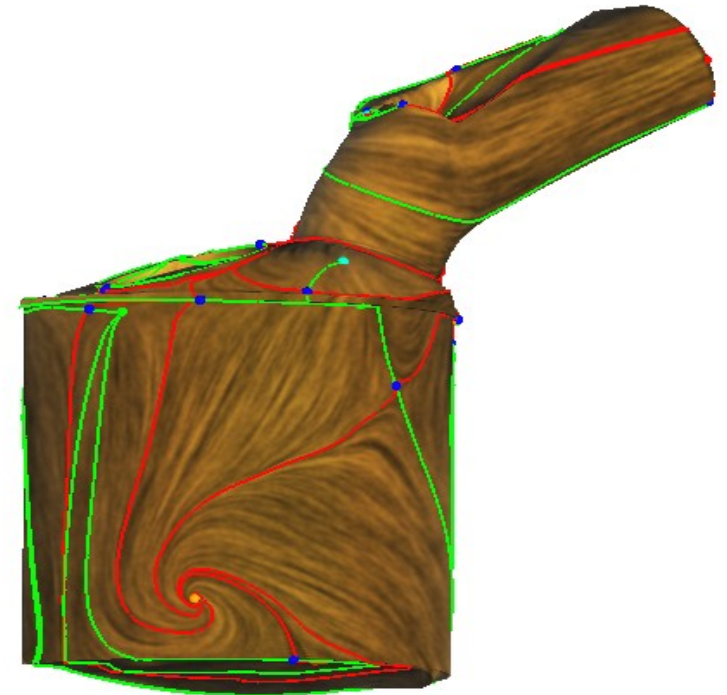
Overview

- Abstract
- Introduction
 - Paper titles,
 - Temporal planning
 - LaTeX
- Related Work
 - Literature searching
 - Collaborations
- Method
 - Method Overview
 - Stage N
 - Parameters
 - Figures and images
- Enhancements



Overview (Continued)

- Implementation
- Results and Performance
 - Results
 - Performance Analysis
- Application Papers
- Conclusions and Future Work
- Acknowledgements
- On Proof Reading
- References
- Citations to examples are provided throughout



Abstract

- Writing starts with Abstract
- 6-12 sentences (recall: rough guideline)
- ✓ Identify research topic
- ✓ Describe novelty of work
- ✓ Identify benefits and advantages
- Sample Abstract given

Introduction (Motivation)

- Introduction Section should really be called “Motivation”
- “What is this research topic good for?”
- Novelty, benefits, and advantages of research is described.
- A bulleted list of contributions is given including words like, “novelty”, “contribute”, and “advantageous”
- Mention challenges
- Wrap up with paper summary
- Example Introduction given

On Paper Titles, Temporal Planning, and LaTeX

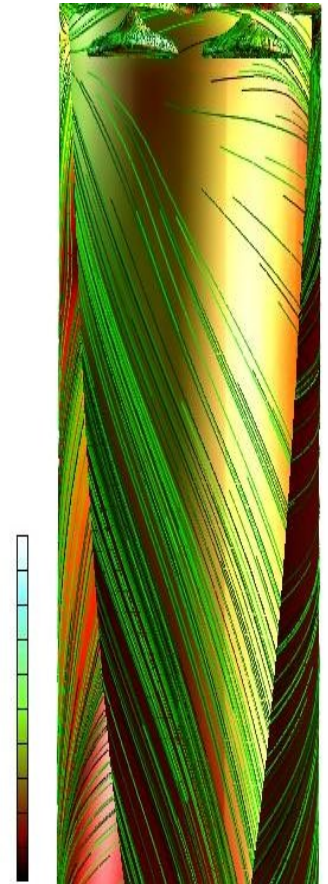
- Paper titles need to be both descriptive *and* concise (three words theory)
- Can be resolved using the **title:subtitle** combination
- Two months (minimum) are needed to write high quality transcript (recall: for beginners)
- LaTeX produces high quality, publishable output



Related Work

- A defining characteristic of a research paper
- Choosing scope can be difficult
- Each paper described ~2-3 sentences
- Differences with current work need to be clear
- Subjectivity involved -can influence choice of reviewers
- Use names not just numbers, e.g. Jobard et al. [1]
- Sample Related Work Section provided

Most previous literature for *this* paper focuses on negative



On the Literature Search and Collaborations

- Basic literature search consists of browsing last 10 years of the IEEE Visualization and EuroVis (formally VisSym) Conference Proceedings
- More papers will be found in the References section of those papers
- Don't forget to look for State-of-the-Art (STAR) reports in Eurographics and ACM Computing Surveys
- Observe the number of papers on the topic
- Collaborations can help fill gaps in knowledge

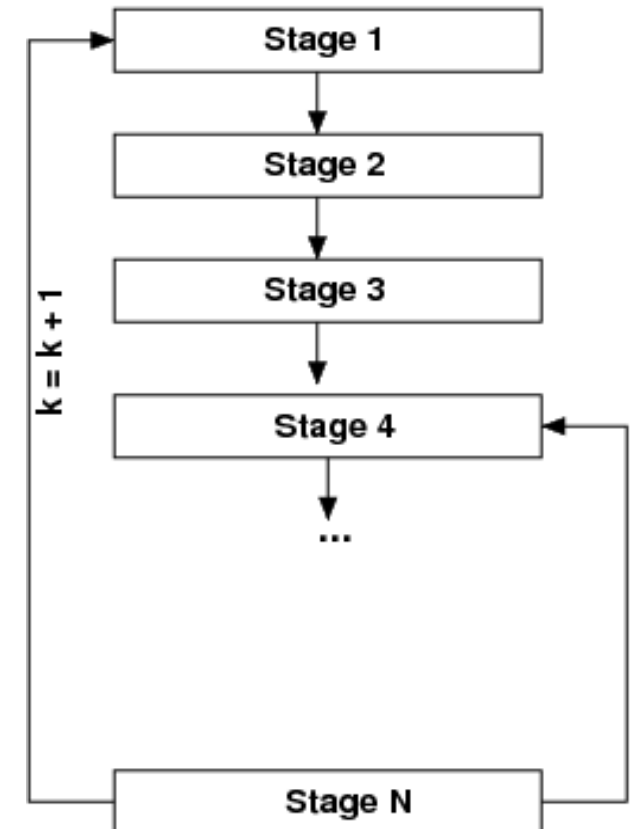


Method (or Computational Model)

- Main focus of paper
- Presents an idealized model or process by which algorithm or system works
- Contains enough detail such that results can be reproduced
- Starts with an Overview Section
- Examples are cited

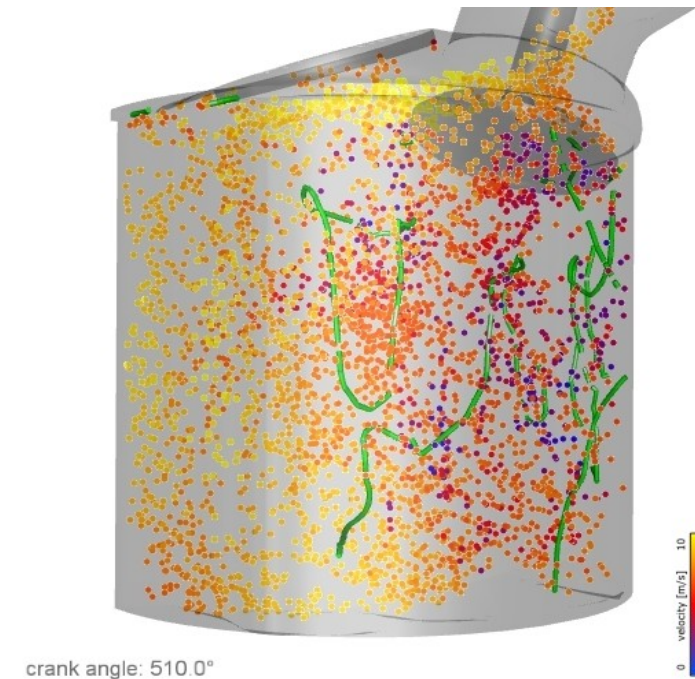
Method: Method Overview

- Method section starts with Method Overview Subsection
- Overview contains overview diagram or illustration
- Overview diagram depicts ideal conceptual model (as opposed to implementation)
- Method Section follows a divide-and-conquer approach: one sub-section per component in the overview diagram
- References to good examples given



Parameters, Figures, and Images

- New algorithms and systems introduce new parameters, e.g., threshold values, alpha values, special distances, min. and max. values
- Identify and discuss these new parameters, illustrate the range a values
- Figures + Captions should be self-contained
- Readers and reviewers often start with figures and images
- Images that show a *new* visualization are very good
- Pedagogic figures are good
- Xfig and Inkscape are two open-source packages for good figure writing



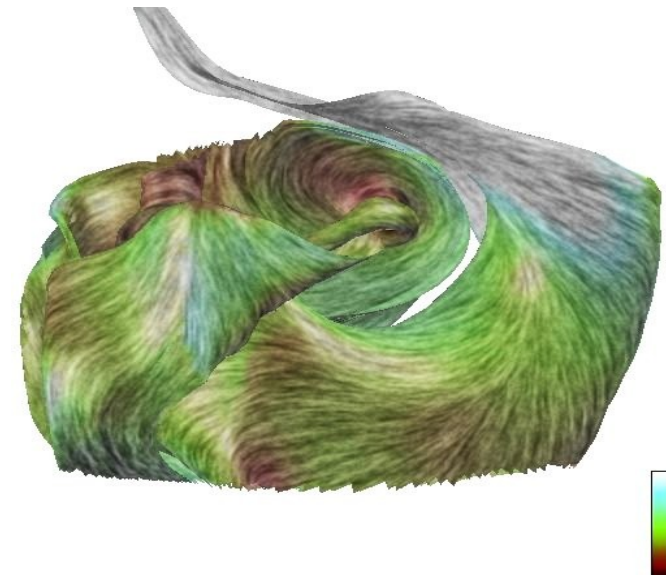
Enhancements (or Extensions)

- An Enhancements section may follow the Method section
- Often describes things that can be done to improve or extend the output of the basic algorithm
- Usually optional, but add a polish to existing work
- Implementation Section is optional and describes implementation details of model
- Describes aspects of model that are *unexpected*
- Sometimes implementation details are integrated into Method sub-sections



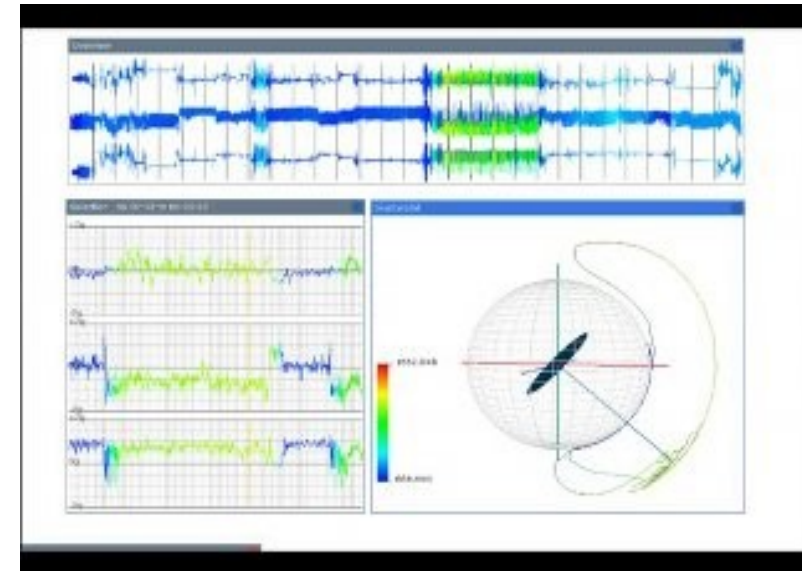
Results and Performance

- Results and Performance Analysis can be separate or together
- Results show nicest images being applied to both synthetic and real-world data sets
- Don't forget to include a description of the data sets, e.g., size, resolution, grid, dimensionality, attributes etc.
- Performance analysis often show a trade-off between accuracy and speed or memory and speed
- A good performance analysis also shows limits of algorithm
- References given to examples



Application Papers

- Present contribution of visualization technique(s) to understanding of application-specific data
- Introduction Section is similar
- Related Work Section is similar-may include domain-specific literature
- May contain additional Background Section
- Contains Visualizations Section rather than a Method Section
- Compares traditional visualizations with modern ones
- Contains Domain Expert Review Section.
- Conclusions and Future Work are similar



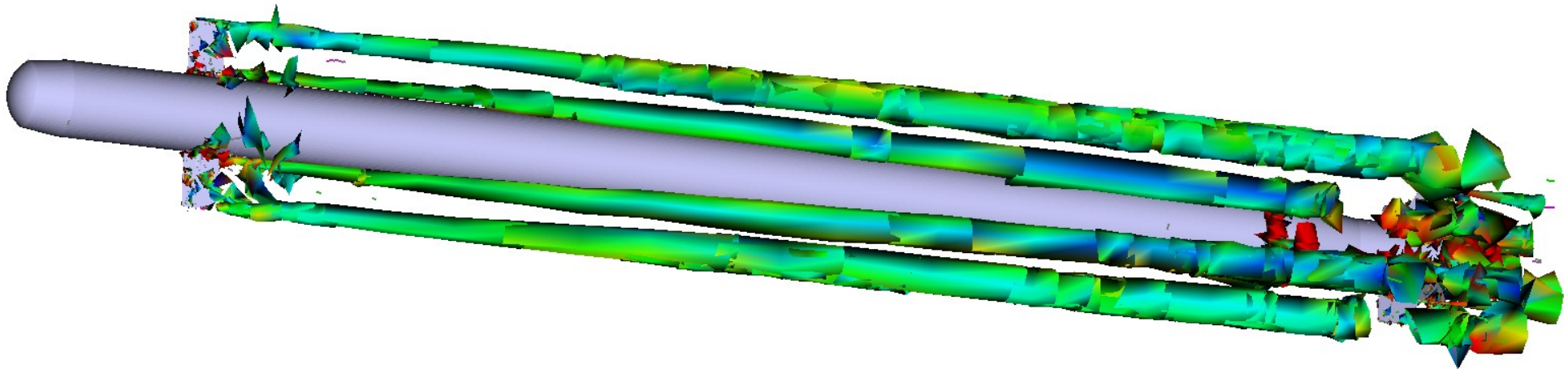
Conclusions, Future Work, and Acknowledgements

- Conclusions summarizes paper and re-emphasize the novelty, benefits, and advantages of presented work
- Future work is usually kept short to save space
- Example Conclusion and Future Work Section given
- Acknowledgements thank funding agencies involved
- Acknowledgements can also be used to thank contributors or potential reviewers
- Sample Acknowledgements Section given



On Proof Reading

- Ideally, paper is proof read by a new reader before submission
- References are complete and carefully proof read
- Some reviewers start with the references
- Many references (~37) are provided



Acknowledgements

- Thank you for your attention! Any questions?

We would like to thank the following:

- Benjamin Spencer, Edward Grundy, Eugene Zhang, R Daniel Bergeron, Helwig Hauser, and Colin Ware, and all other co-authors
- PDF versions of some papers can be found at:

<http://cs.swan.ac.uk/~csbob>

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