PG 2011

The 19th Pacific Conference on Computer Graphics and Applications
(Pacific Graphics 2011) will be held on September 21 to 23, 2011 in Kaohsiung, Taiwan.

Illustrative Line Styles for Flow Visualization

Maarten H. Everts, Henk Bekker,
Jos B.T.M. Roerdink, and Tobias Isenberg
University of Groningen, The Netherlands

university of groningen

Introduction

Simulations of flow of fluids and gasses

↓

Large 3D vector fields

↓

Streamlines

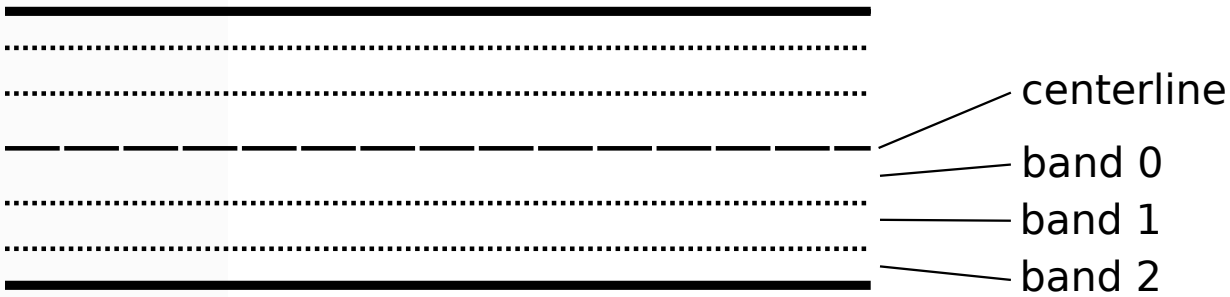
- Our contribution: flexible line styles for streamlines.
- Our inspiration: illustrations

Line style model

Subdivision of line strips into *bands*.

Provide the granularity.

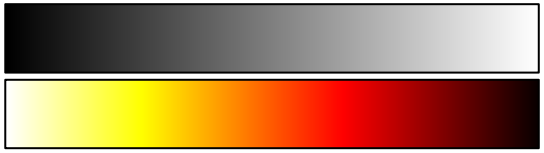
Visual properties (color, width, and distance offset) can be manipulated independently.



Local attribute mapping

Mapping of local flow attributes (temperature, velocity, etc,) to visual properties:

- Band color (i.e., colormaps)



- Band width

Flexible band shapes

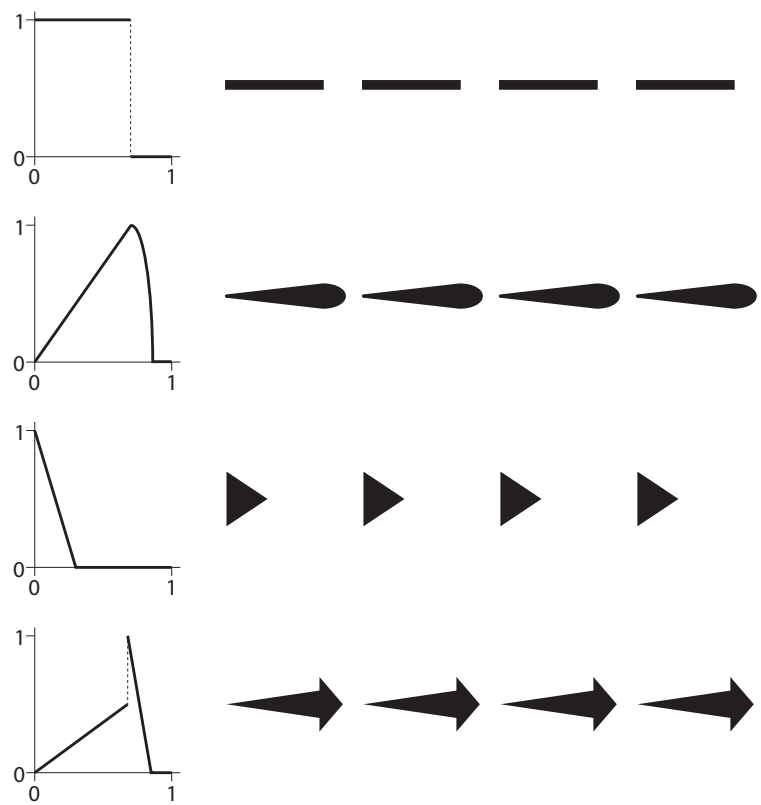
For repeating shape patterns:

- Shape mapping function
- Line shape attribute

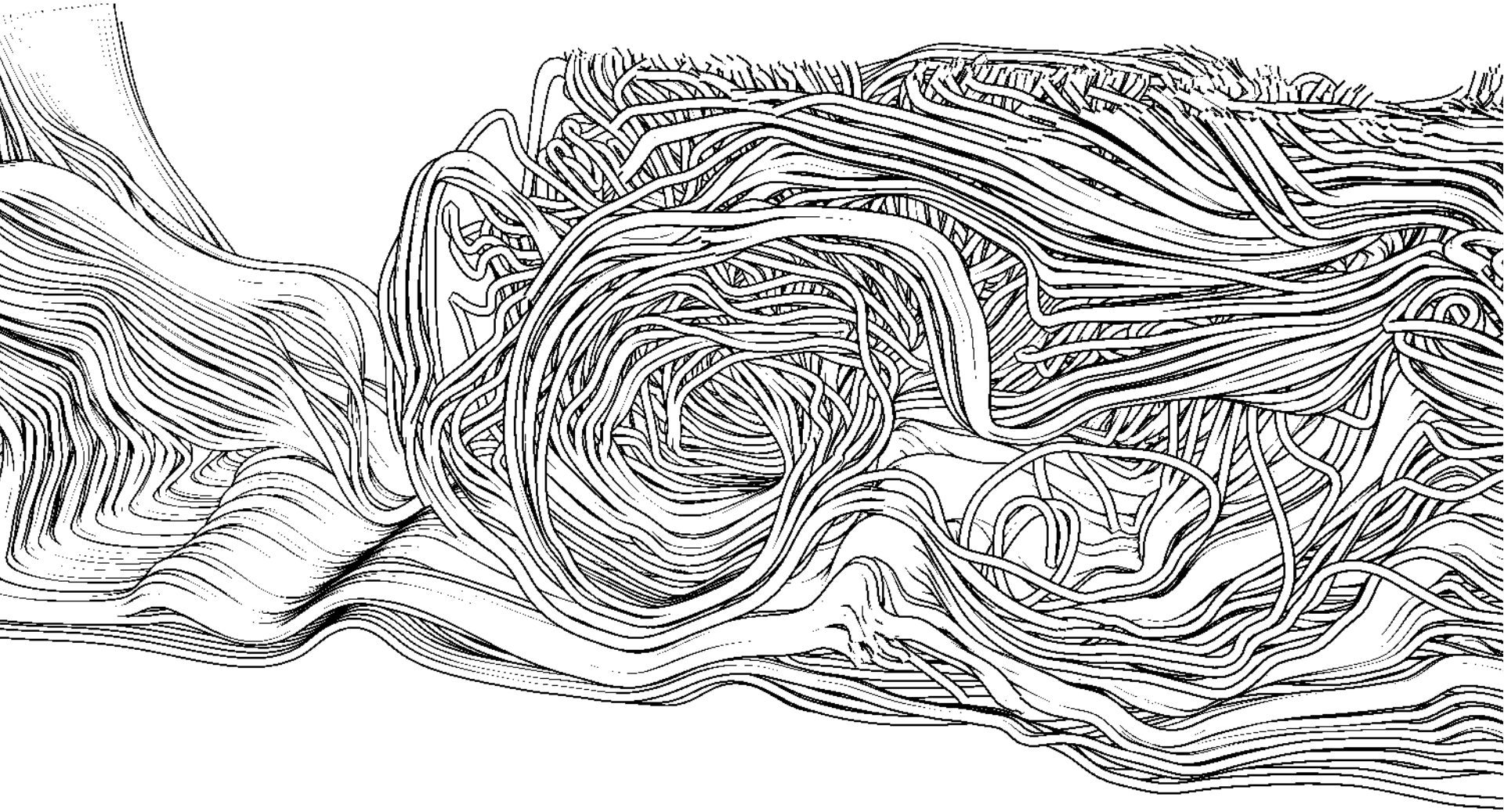
$$s_x = \frac{x}{l} \bmod 1$$

Integration time as attribute:

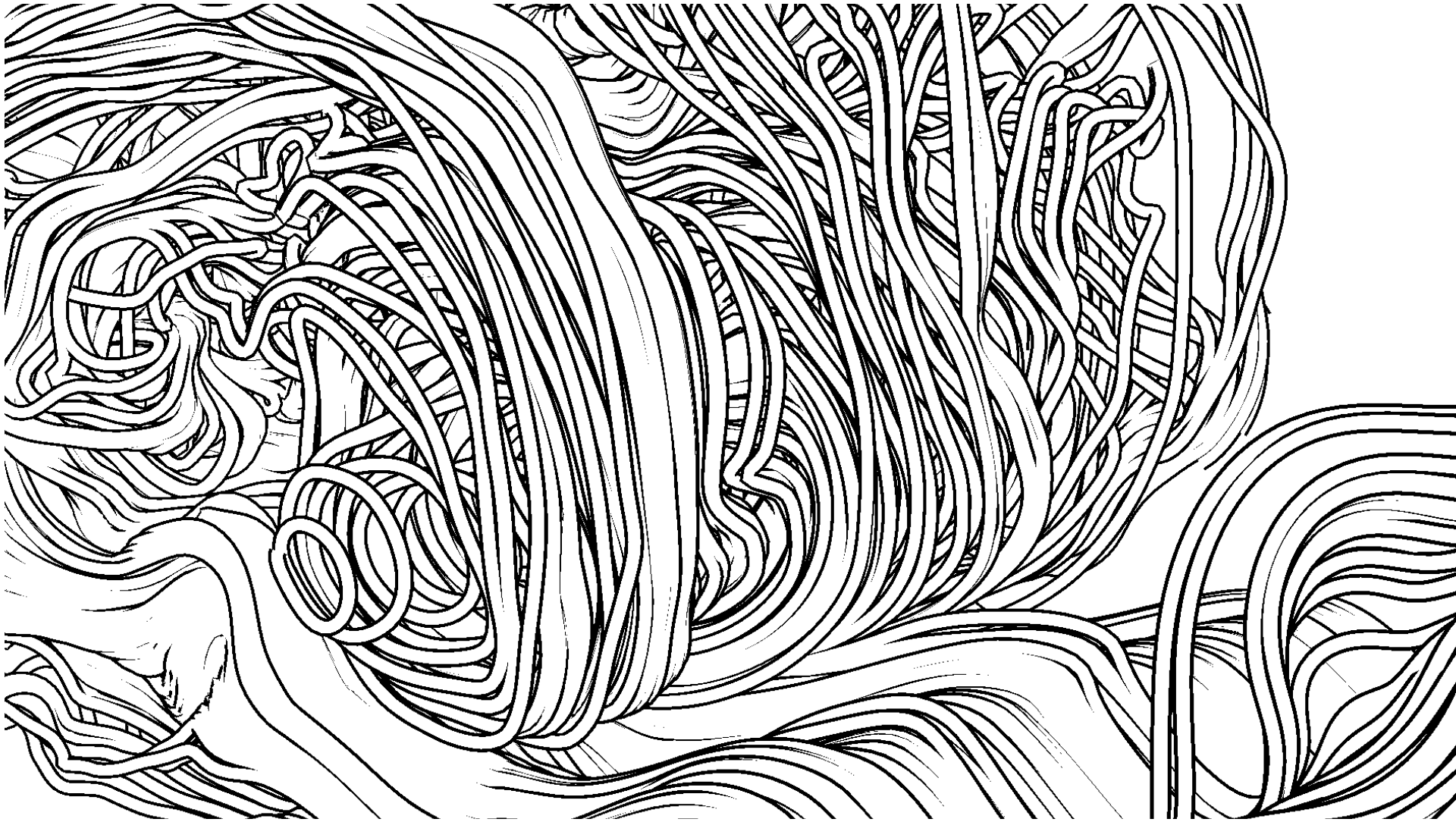
velocity encoded as shape frequency

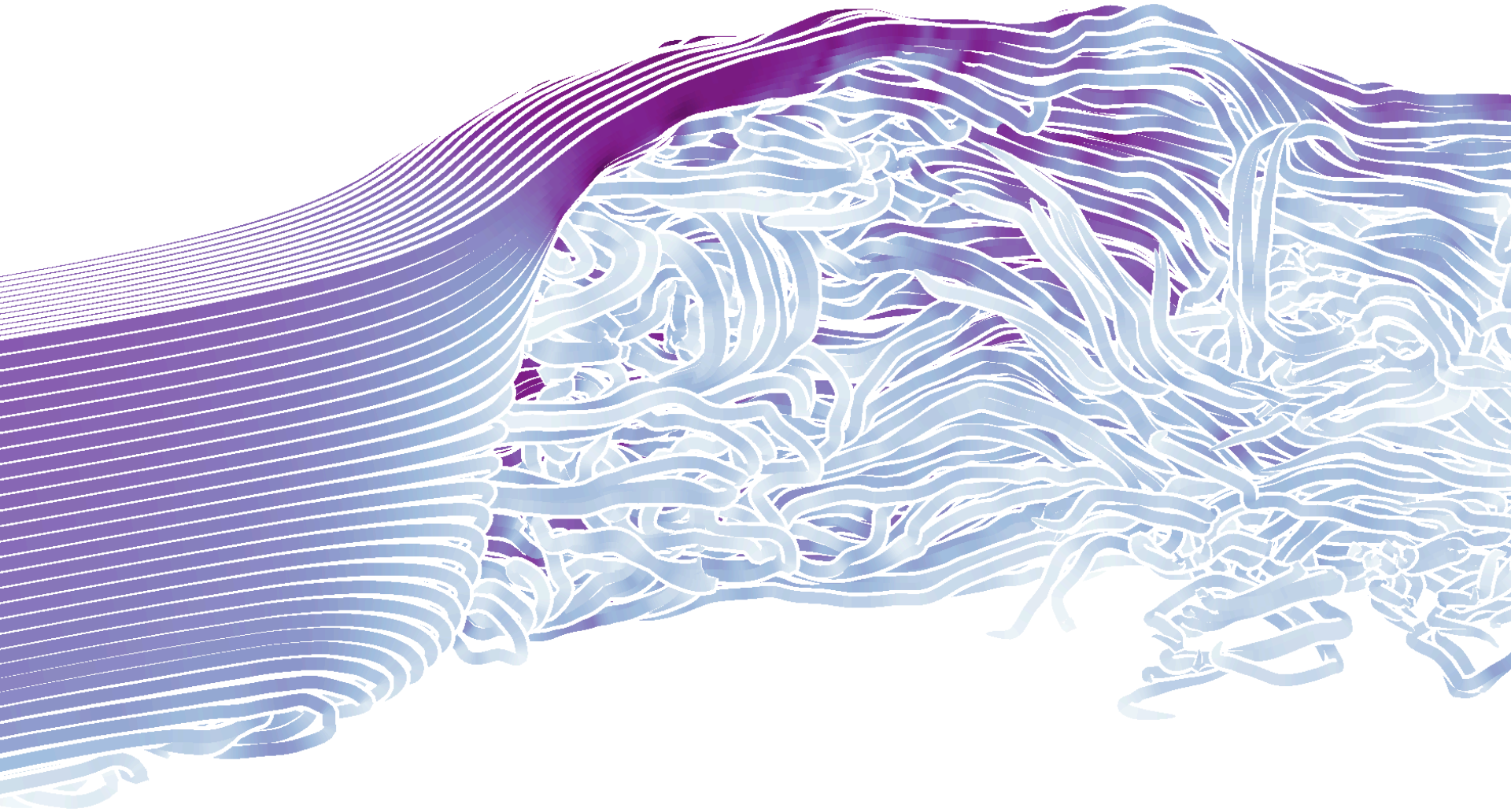


Results

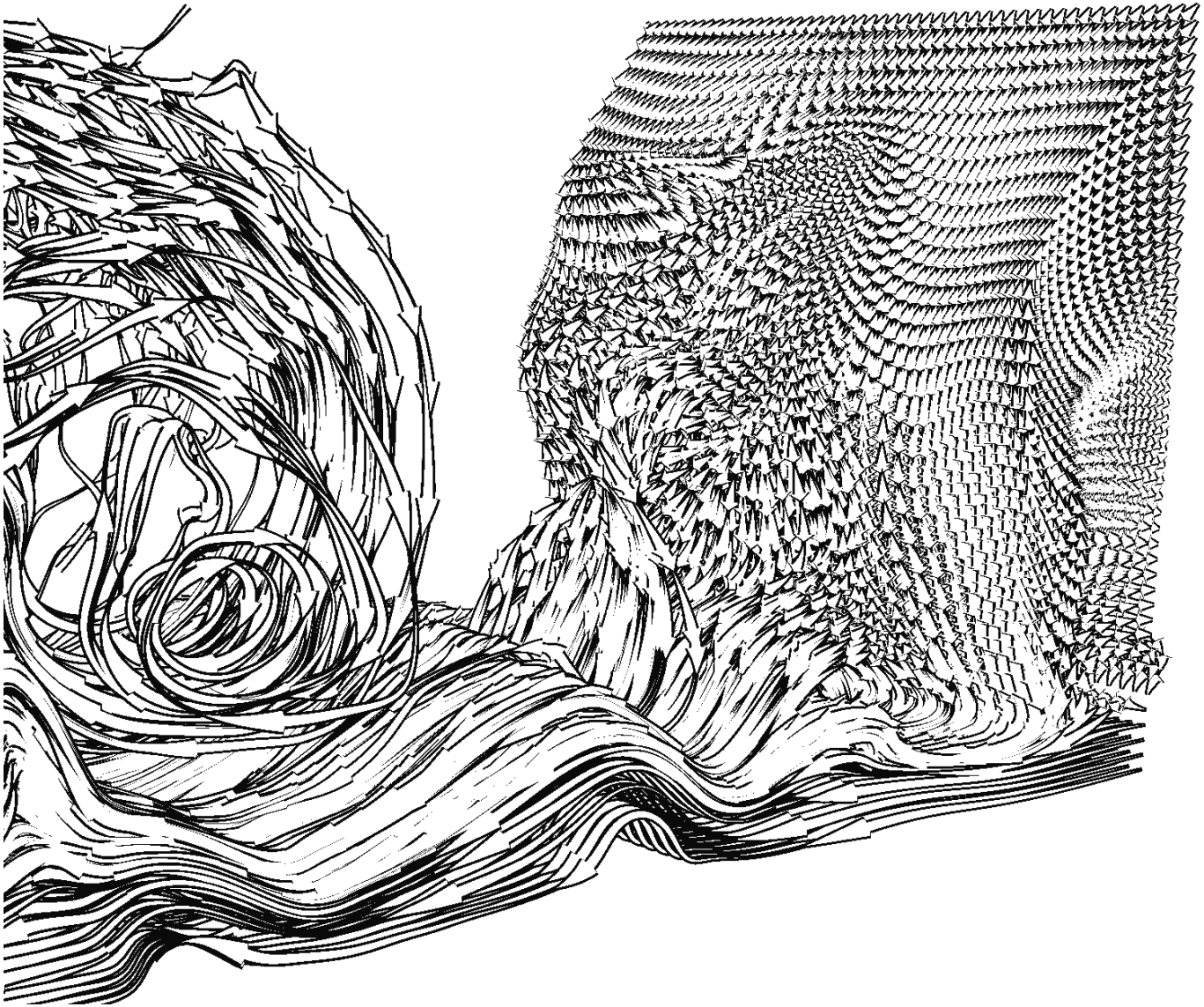


fg2011

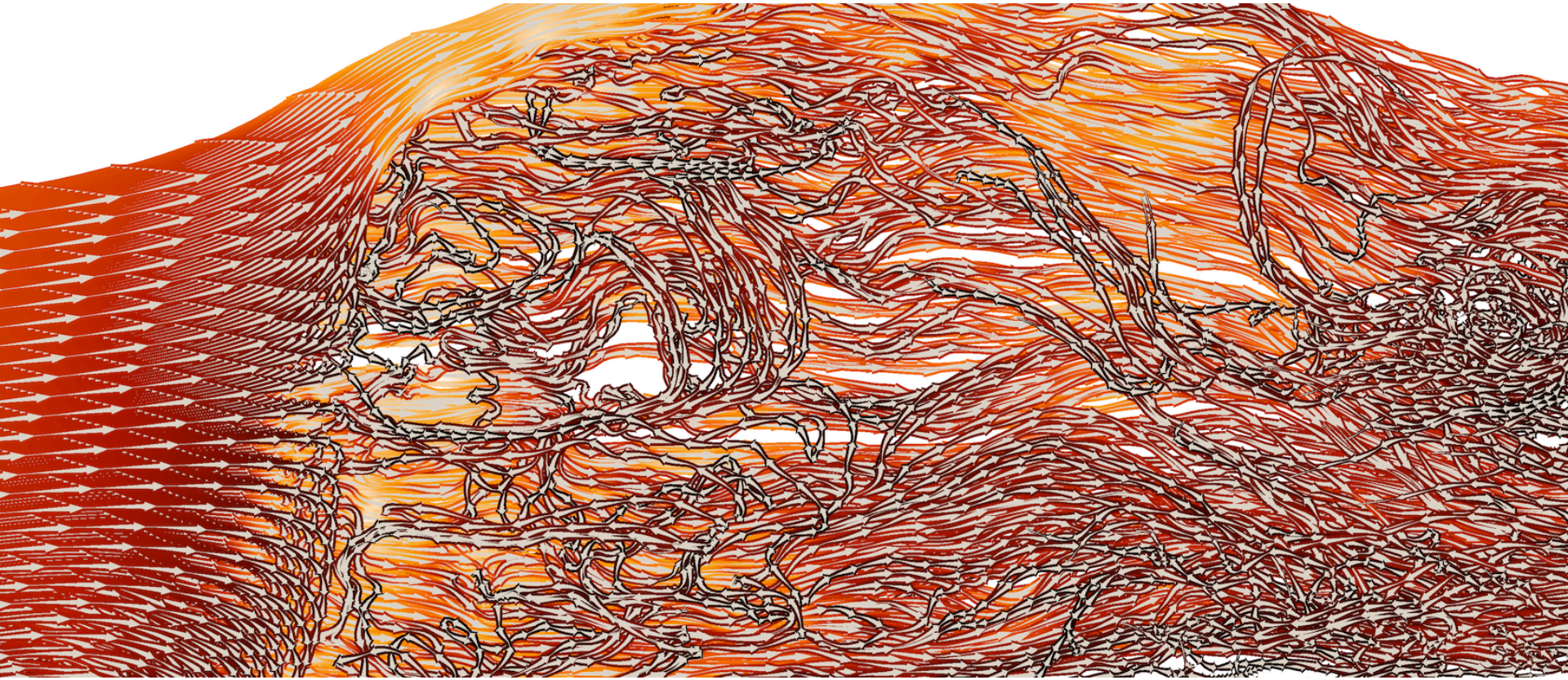




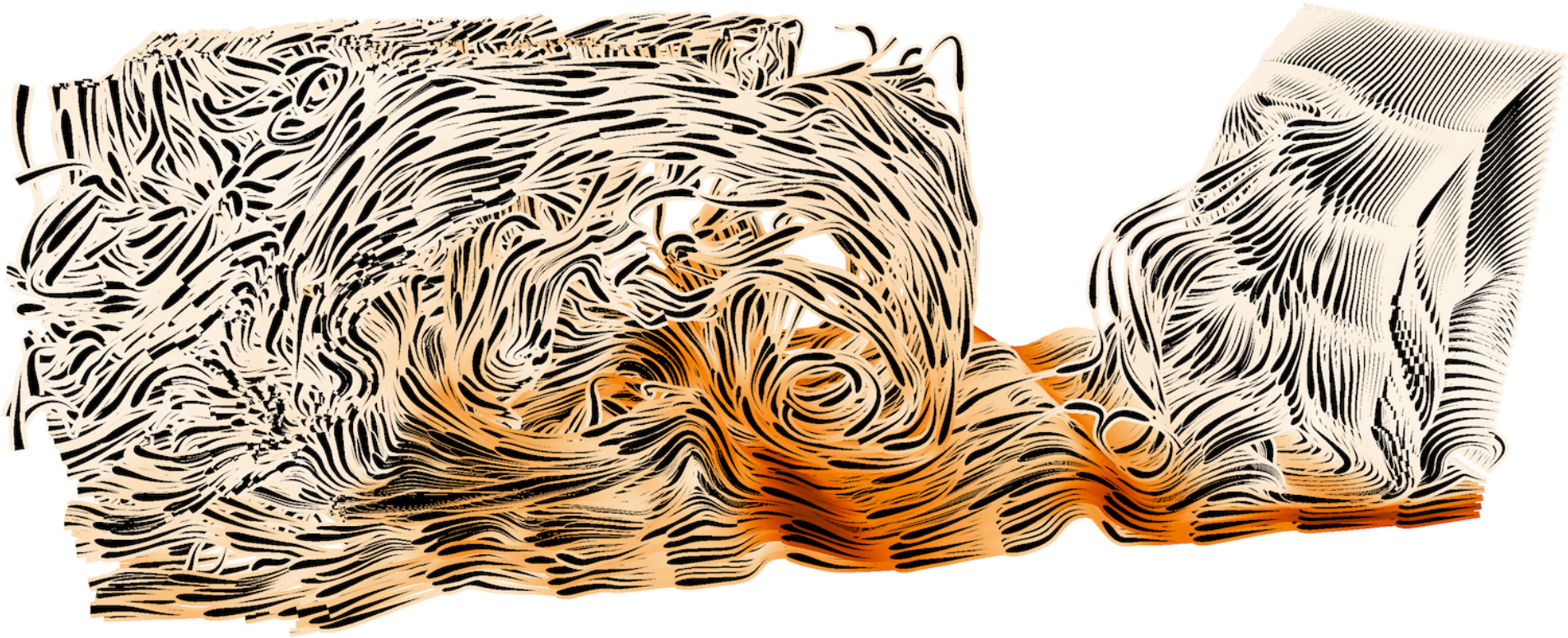
fg2011



PG2011



fg2011



Discussion

- Fast and flexible GPU implementation.
- Interactive manipulation of line style parameters.
- Positive feedback in an informal evaluation with a fluid mechanics expert.

Conclusion

- Introduction of a flexible illustrative line style model for visualizing flow streamlines.
- Fast GPU implementation.