

Comparing 2D Vector Field Visualization Methods: a User Study

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2D Vector Field

Definition

A vector field is an assignment of a vector to each point in a subset of space.

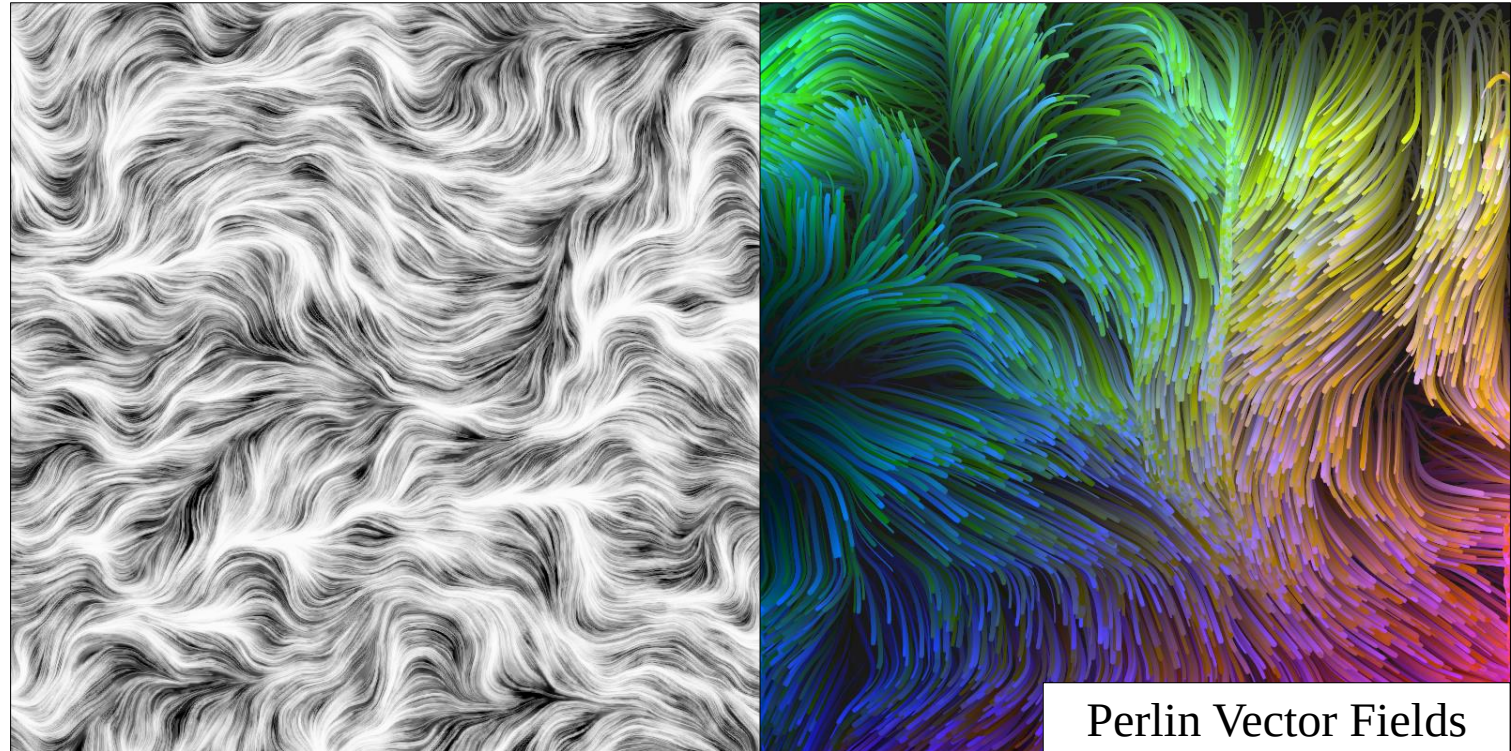
Applications

Fluids

AI

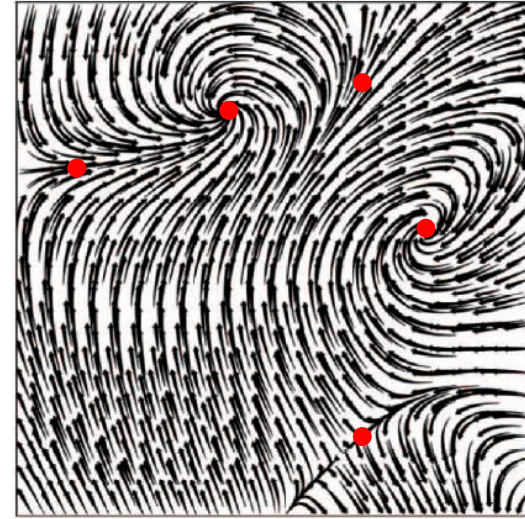
Meteorology

...

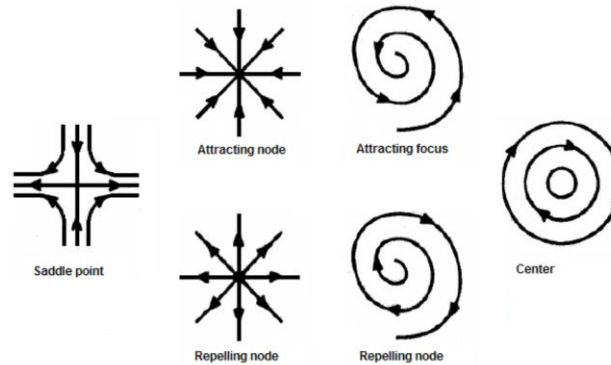


User Tasks

Choosing the number and location of all critical points in an image



Identifying the type of a critical point



Predicting where a particle starting at a specified point will advect



2D Vector Field Visualization

GRID: icons on a regular grid

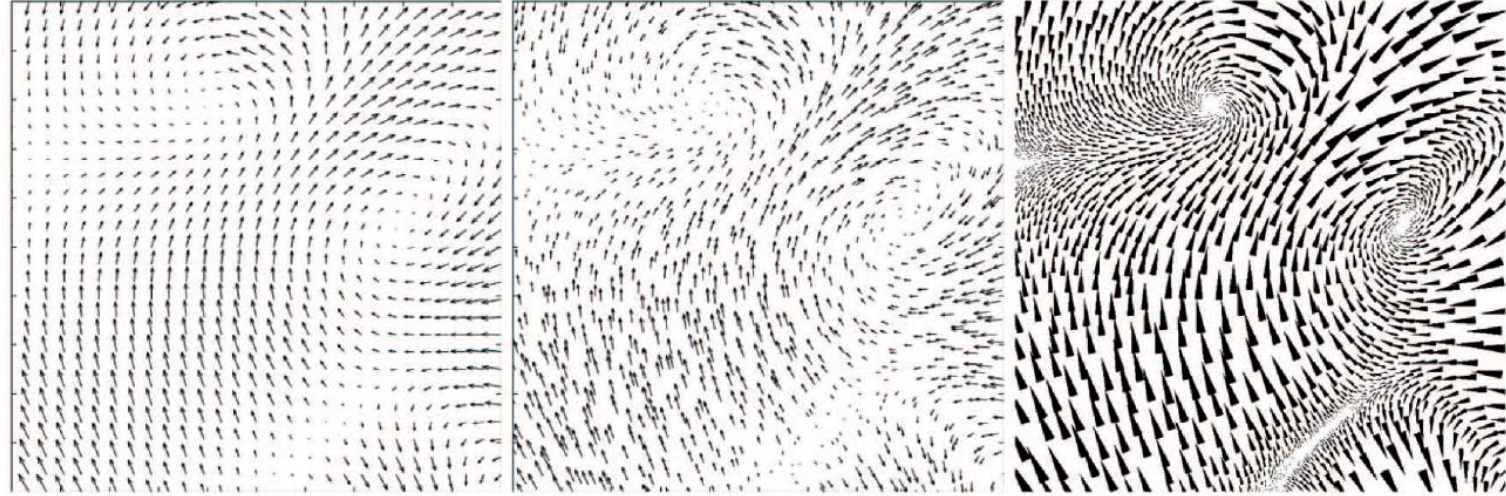
JIT: icons on a jittered grid

LIT: borrows from oil painting

LIC: line-integral convolution

OSTR: image-guided streamlines

GSTR: streamlines seeded on a regular grid



GRID

JIT

LIT

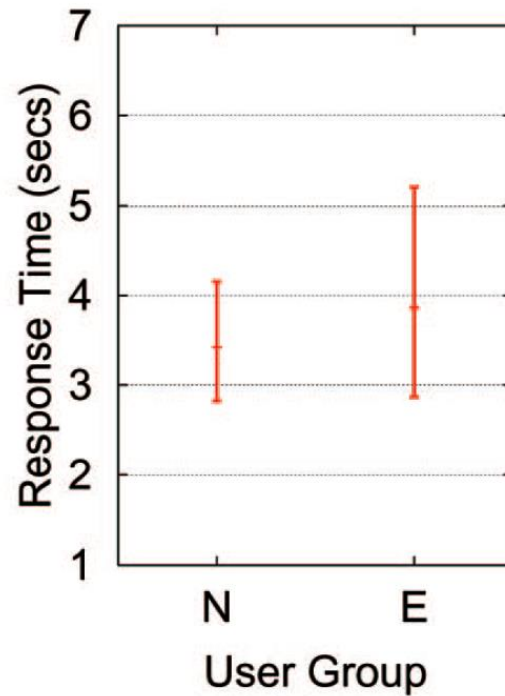
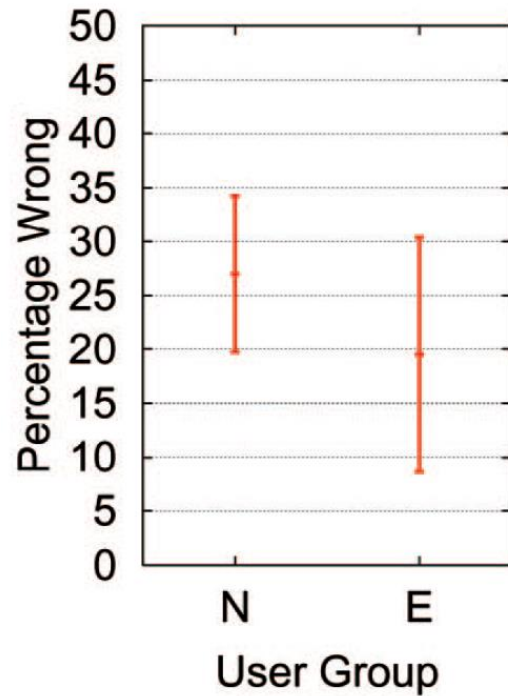


LIC

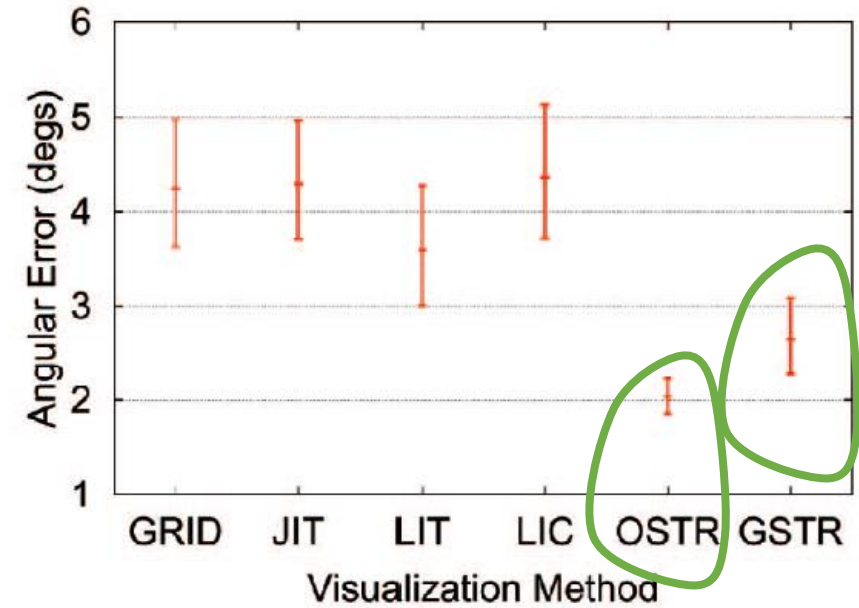
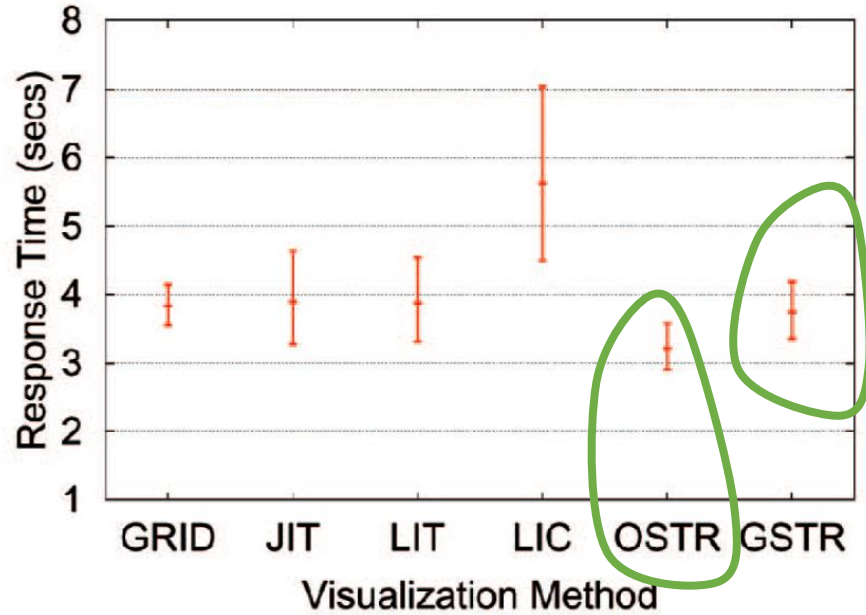
OSTR

GSTR

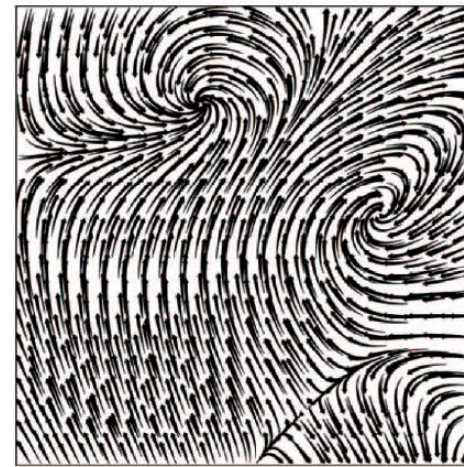
Results: Experts vs Non-Experts



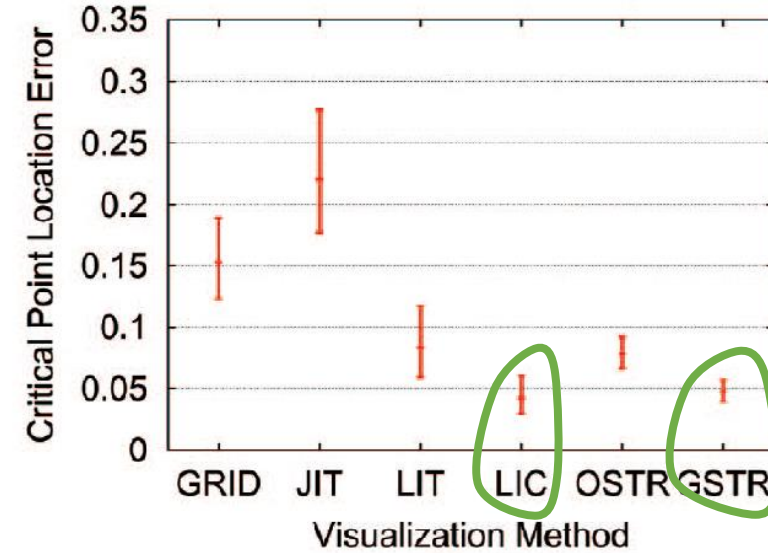
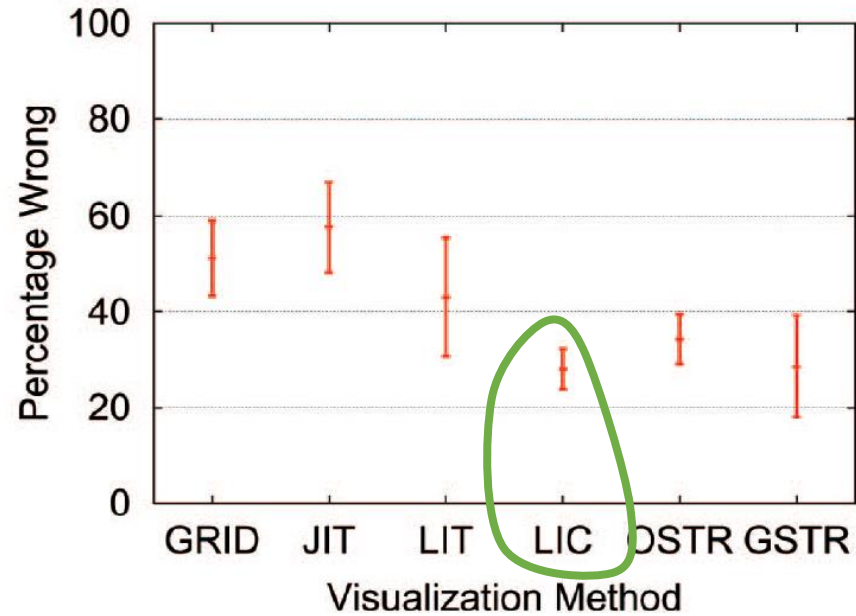
Results: Advecting a Particle



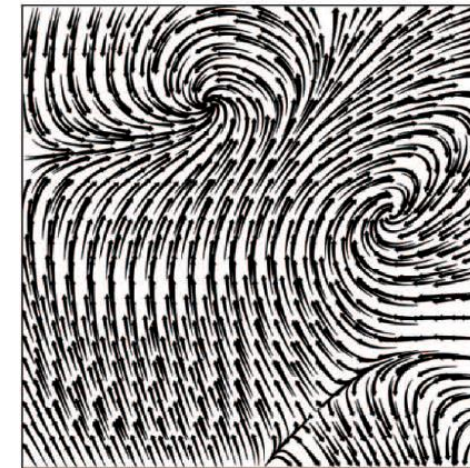
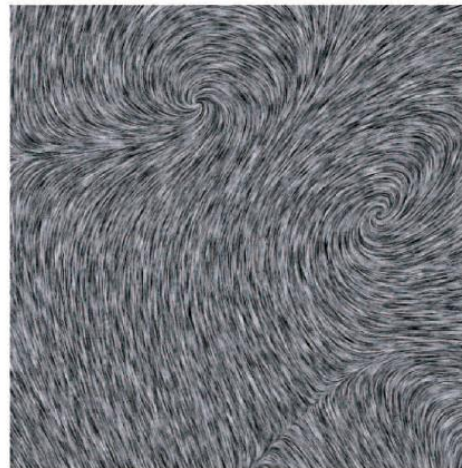
Best: OSTR/GSTR



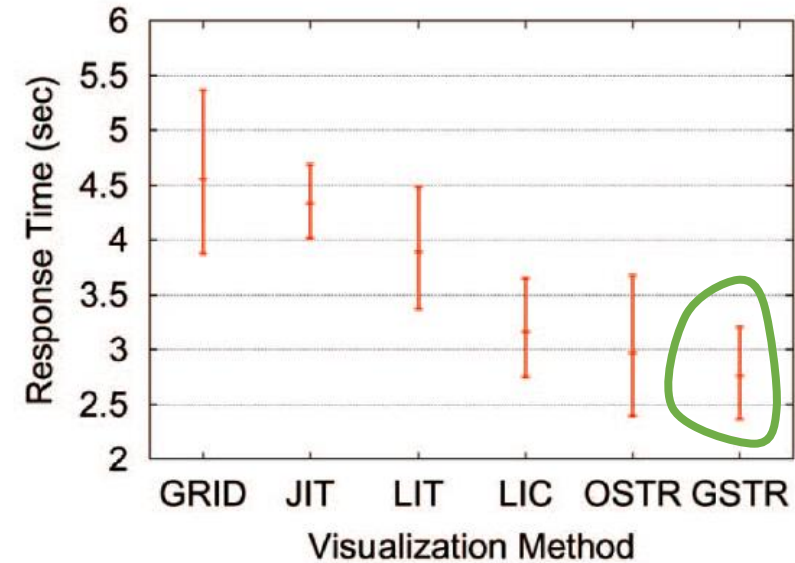
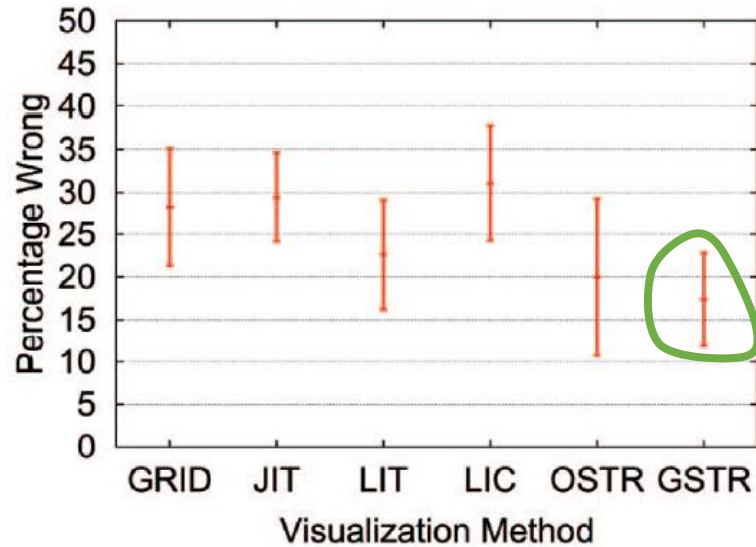
Results: Locating Critical Points



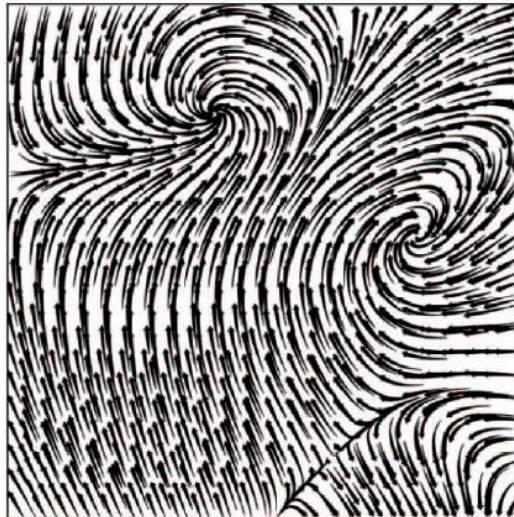
Best: LIC/GSTR



Results: Identifying the type of a critical point



Best: GSTR

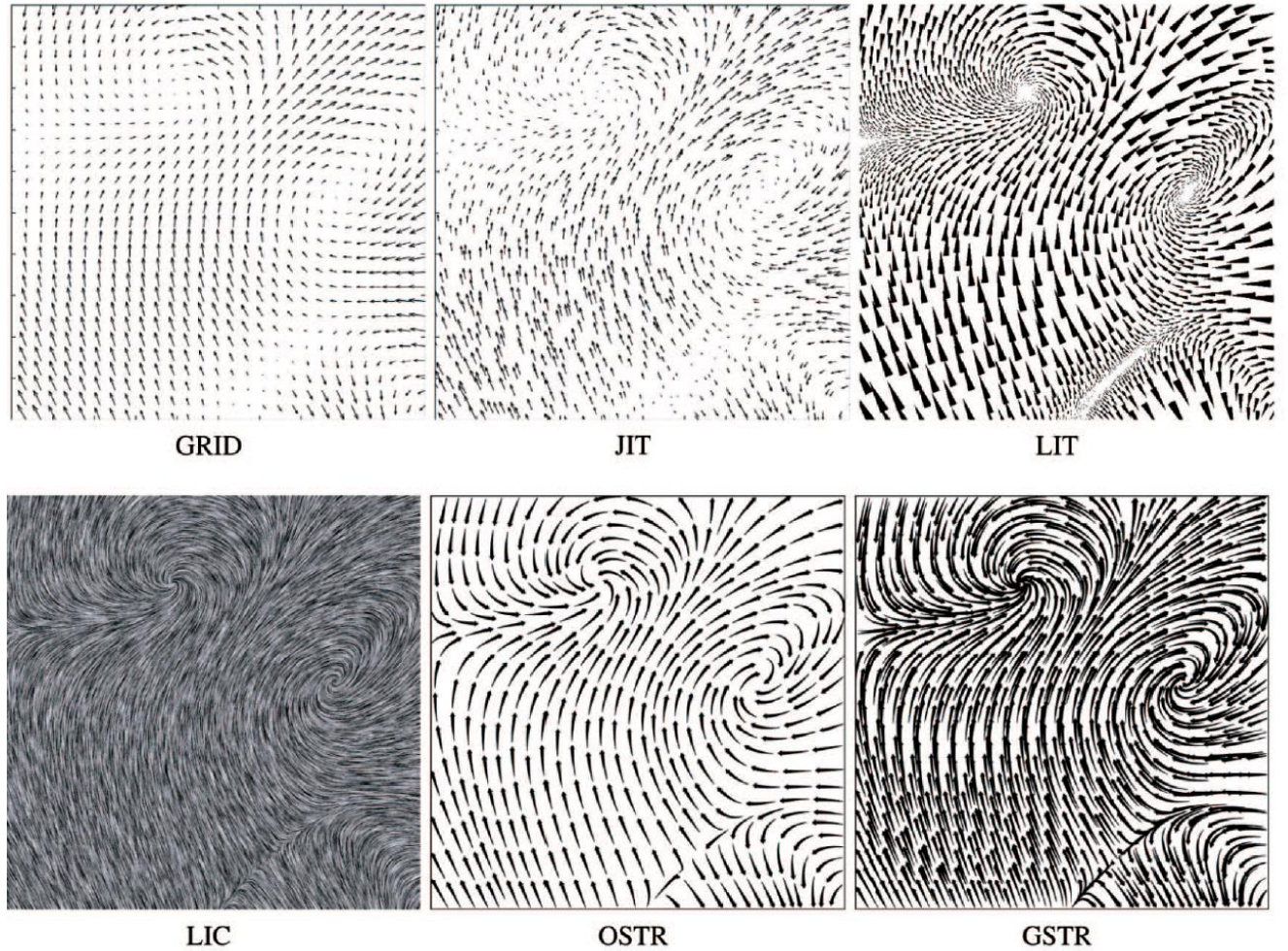


Conclusion

1) Pas de différence entre les experts et non-experts

2) GRID / JIT => en dessous en la moyenne

3) GSTR meilleure méthode en moyenne



Links

<https://earth.nullschool.net/>

<http://vis.cs.brown.edu/results/videos/bib/pdf/Forsberg-2009-CFM.pdf>

(Shortened Link) shorturl.at/nsJO0

Global map of wind on earth

La même, en 3D par les mêmes auteurs

Spin-off par la même équipe sur le 2D