

Multi-field Pattern Matching based on Sparse Feature Sampling

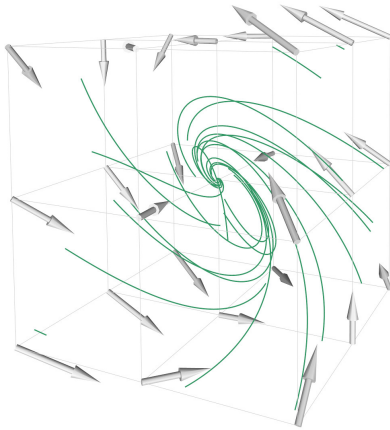
Zhongjie Wang, Hans-Peter Seidel, Tino Weinkauff

We designed 12 vector field patterns in the spirit of Ebling et al. [1] and Heiberg et al. [2]. We made sure to include all patterns mentioned in these papers. As we will see in the following, we find SIFT features for all these patterns. Hence, our method can handle the same vector field patterns as these previous methods.

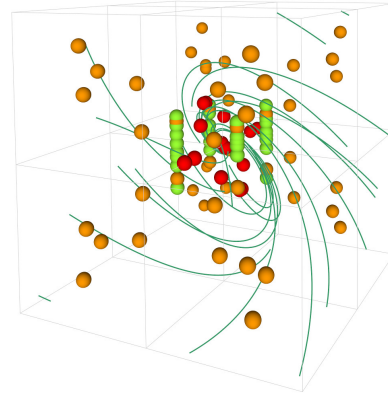
For each vector field pattern, we consider 5 types of trait fields, i.e., Curvature (●), Divergence (●), Helicity (●), λ_2 (●), and Okubo-Weiss (●). In the following figures, we render the locations of the SIFT features as spheres using these colors.

References

- [1] J. Ebling and G. Scheuermann. Clifford convolution and pattern matching on vector fields. In *Proc. IEEE Visualization*, pages 193–200, 2003.
- [2] E. Heiberg, T. Ebbers, L. Wigstrom, and M. Karlsson. Three dimensional flow characterization using vector pattern matching. *IEEE Transactions on Visualization and Computer Graphics*, 9(3):313–319, 2003.

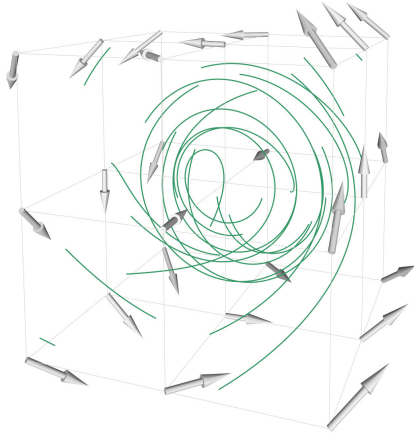


(a) Pattern.

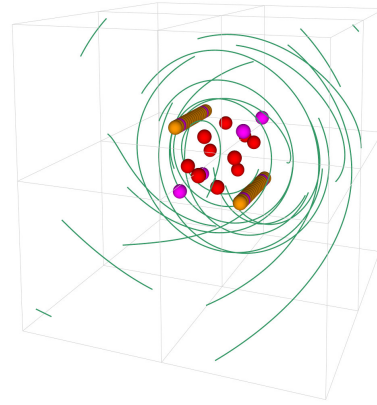


(b) SIFT features.

Figure 1: Attracting Focus.

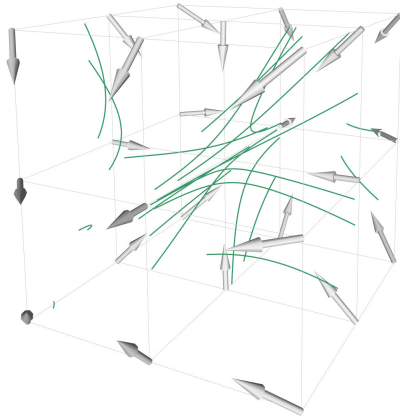


(a) Pattern.

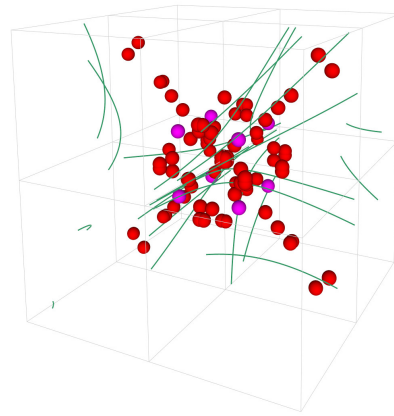


(b) SIFT features.

Figure 2: Attracting Focus Saddle.

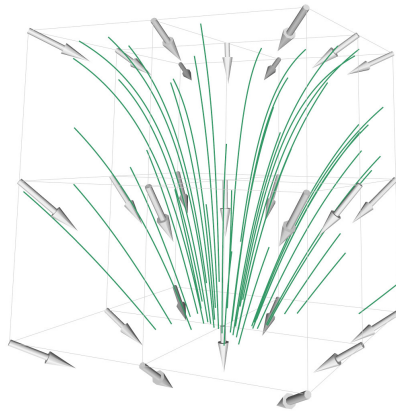


(a) Pattern.

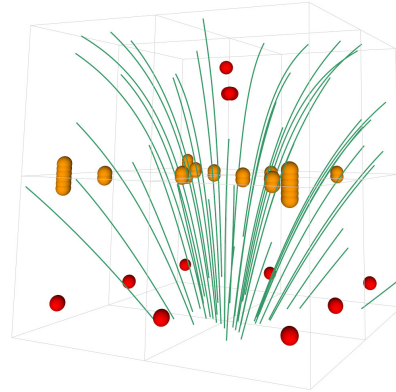


(b) SIFT features.

Figure 3: Attracting Saddle.

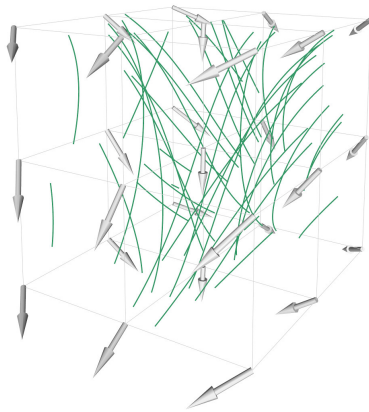


(a) Pattern.

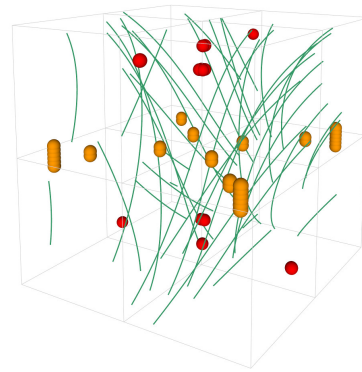


(b) SIFT features.

Figure 4: Convergence.

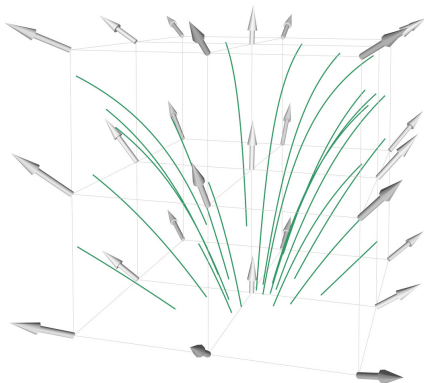


(a) Pattern.

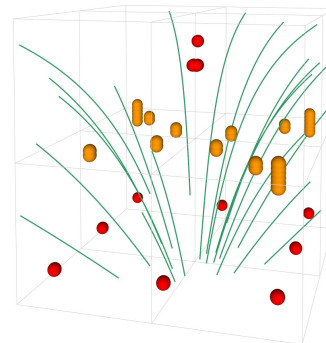


(b) SIFT features.

Figure 5: Convergence Divergence.

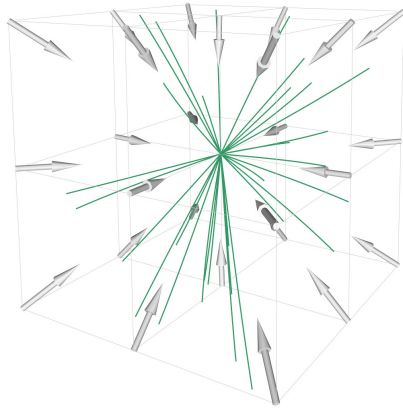


(a) Pattern.

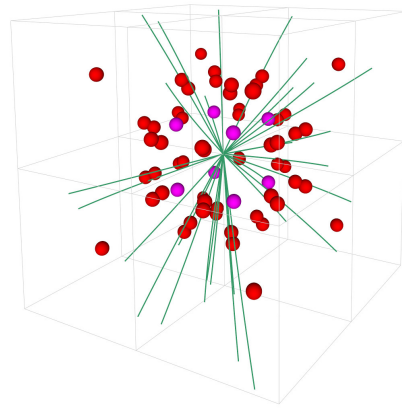


(b) SIFT features.

Figure 6: Divergence.

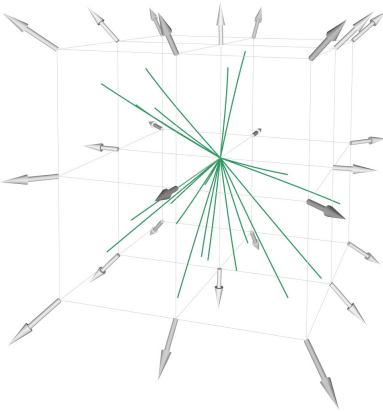


(a) Pattern.

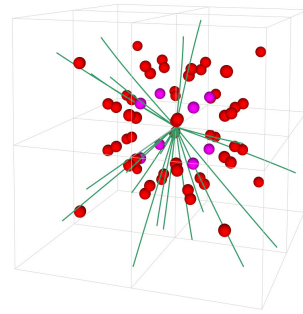


(b) SIFT features.

Figure 7: Node Sink.

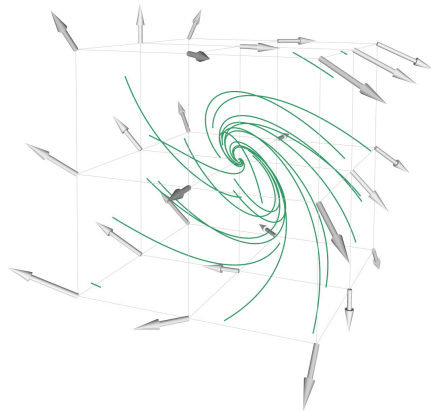


(a) Pattern.

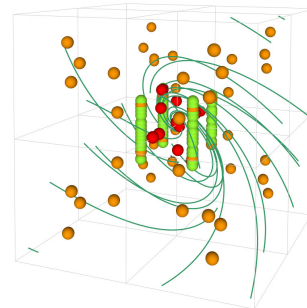


(b) SIFT features.

Figure 8: Node Source.

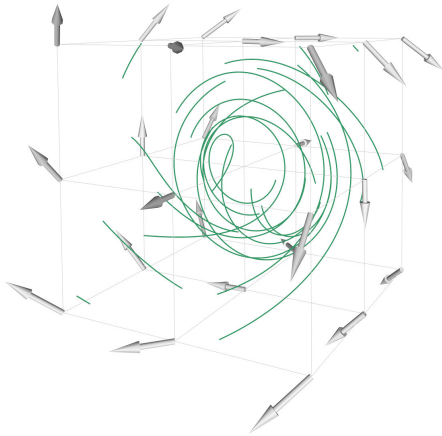


(a) Pattern.

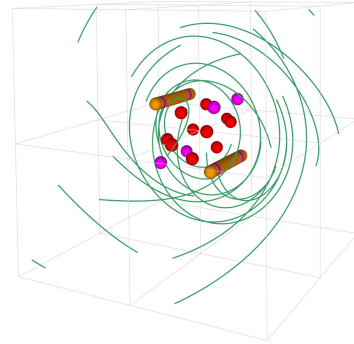


(b) SIFT features.

Figure 9: Repelling Focus.

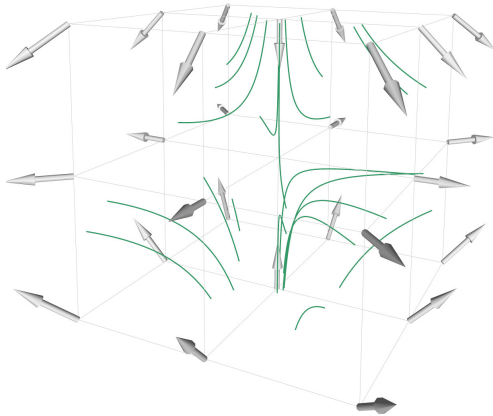


(a) Pattern.

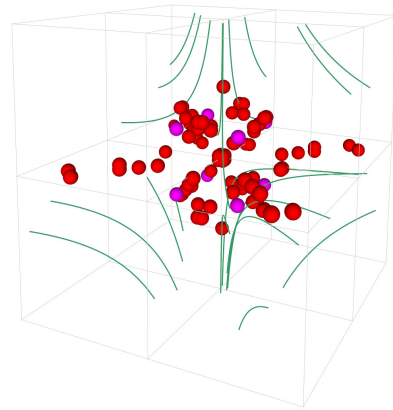


(b) SIFT features.

Figure 10: Repelling Focus Saddle.

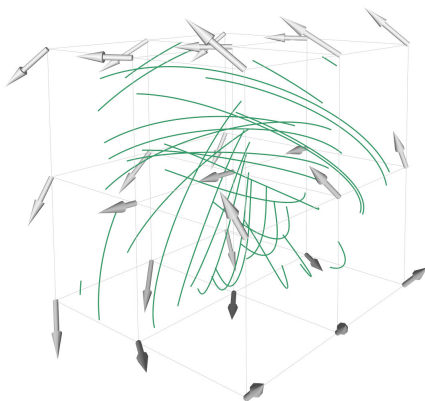


(a) Pattern.

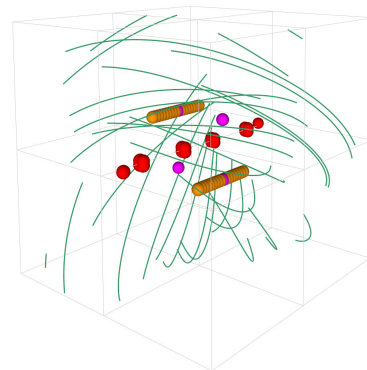


(b) SIFT features.

Figure 11: Repelling Saddle.



(a) Pattern.



(b) SIFT features.

Figure 12: Vortex.