

Visualization of Vector Fields

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- 1 Zkopírujte si předcházející obrázek a doplňte do něj jaký vektor vnímáte (bez výpočtů), že má být uprostřed každé buňky.
- 2 Zkopírujte si obrázek znovu a tentokráte pomocí bilineární interpolace vypočtěte jaký vektor má být uprostřed každé buňky a doplňte vektor do obrázku.
- 3 Jaký je základní problém s vnímáním směru, kterým úsečka směruje ve třírozměrném prostoru?

Firstly, by using a simple line we don't have any information in which direction it points, for that we might use arrows. But even when we use arrow we may misinterpret in which direction it points, for example in the figure 1a it may look like arrows points straight up, but in the figure 1b we can also see that the arrow is tilted.

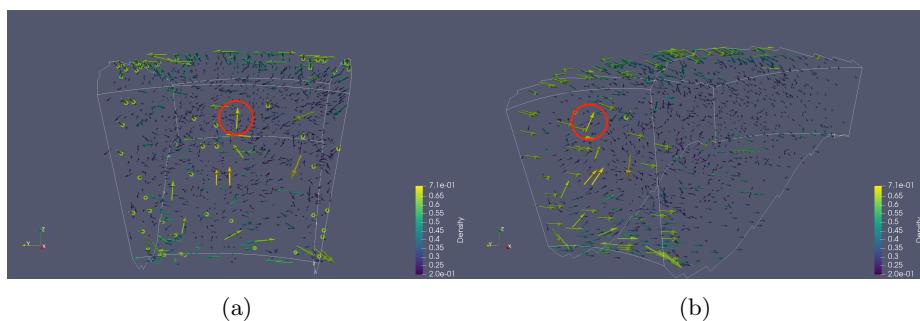


Figure 1

4 Kdy je v datech vidět více informací, když použijeme všechny vzorky nebo když počet vzorků omezíme?

Using less samples reduces the clutter, hence we can see more information on the visualisation with less samples.

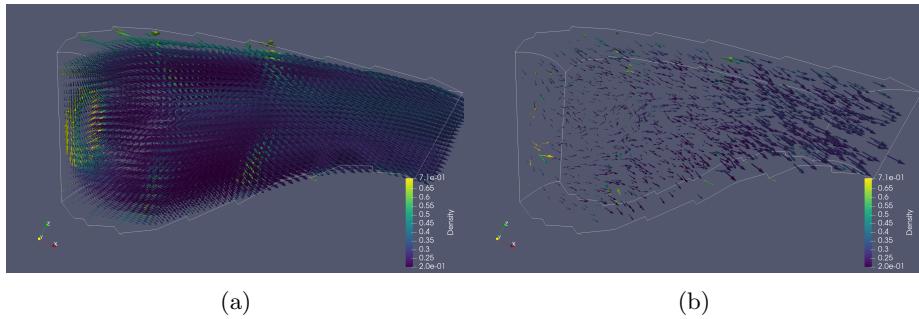


Figure 2

In the fig. 2a we don't see much information because of occlusion and overlap, we can't even clearly distinguish the direction of arrows. While in fig. 2b we can see a general direction of liquid and magnitude of momentum (as size of arrows).

5 Jaké problémy nám přináší pravidelné rozmístění vzorků (All Points nebo Every Nth Point)? Odstraní nepravidelné rozmístění vzorků (Uniform Spatial Distribution) tyto problémy? Jaké problémy může přinést nepravidelné rozmístění vzorků?

Using regular sampling may lead to emergence of some patterns that are not important to interpreting the data. Also, using regular sampling may lead to overlap and occlusion.

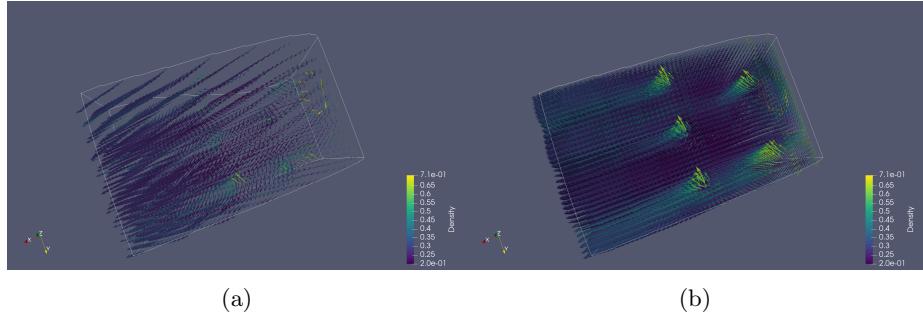


Figure 3

Fig. 3a shows how some patterns may emerge from regular sampling, this pattern is distracting and does not convey useful information. Also, both of the figure above show effect of regular sampling on overlap and occlusion.

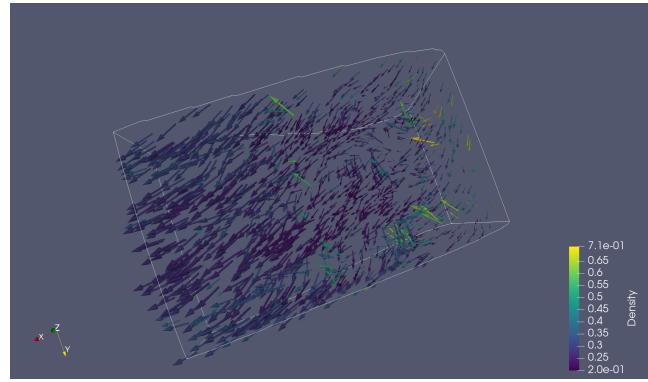


Figure 4

In the figure above we can see that using random sampling we got rid of patterns and also reduced overlap and occlusion.

6 Jak ovlivní změna velikosti glyphu nebo průhlednost glyphu výslednou vizualizaci?

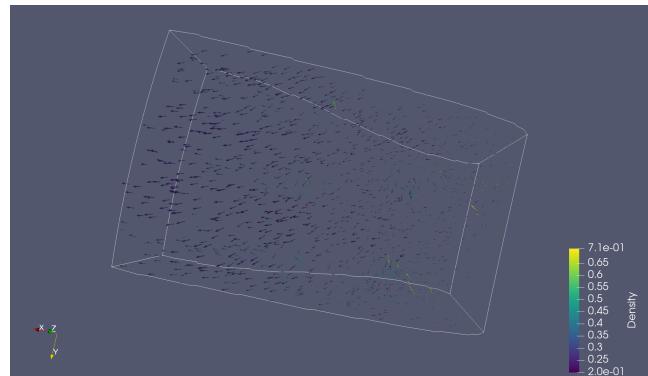


Figure 5: Small size of glyphs

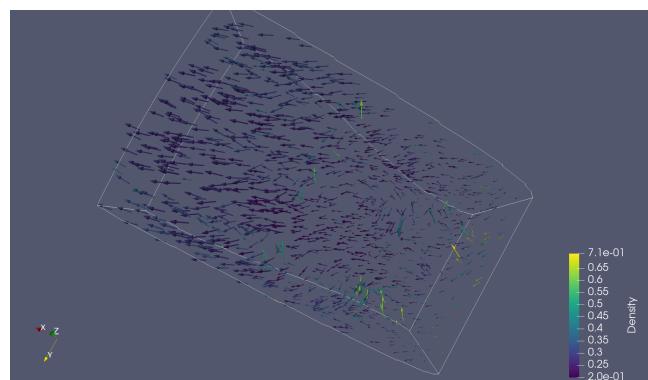


Figure 6: Medium size of glyphs

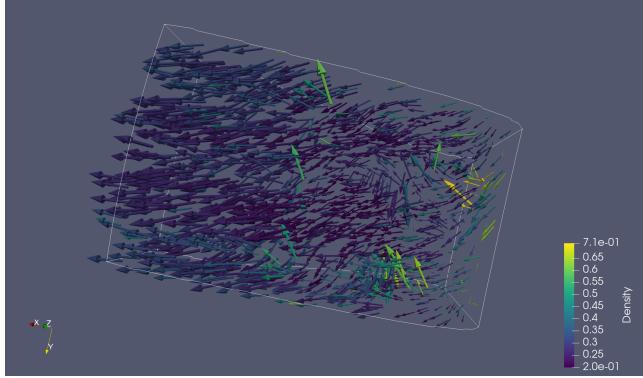


Figure 7: Large size of glyphs

In figure 5 we can see that small size of glyphs make it harder to see useful information, while in 7 we see that the bigger size of glyphs leads to occlusion and overlapping. Figure 6 shows a size of glyphs chosen such that it doesn't produce too much occlusion but also big enough to see useful information.

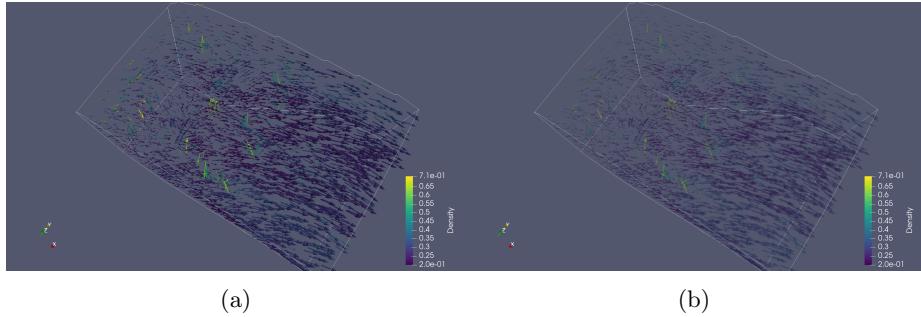


Figure 8: Transparency of glyphs

Using transparency helps to reduce effect of occlusion when we have a lot of glyphs in 3d space.

7 Zamyslete se jak souvisí glyph (šipka) na vyfiltrované ploše s ribbonem v místě kde ribbon protíná plochu. Jakou informaci nám šipka neumožní vidět, ale ribbon ano? Jak bychom to mohly napravit (obecně, ne jen v Paraview)?

I struggle to formulate it clearly but, stream ribbon as a surface can be defined using a normal vector. This normal vector seem to be also normal to vector

from vector field through which this stream ribbon passes. Also stream ribbon goes in the direction where vector from vector field point. So the direction of vector from vector field and its normal vector define how stream ribbon will twist.