

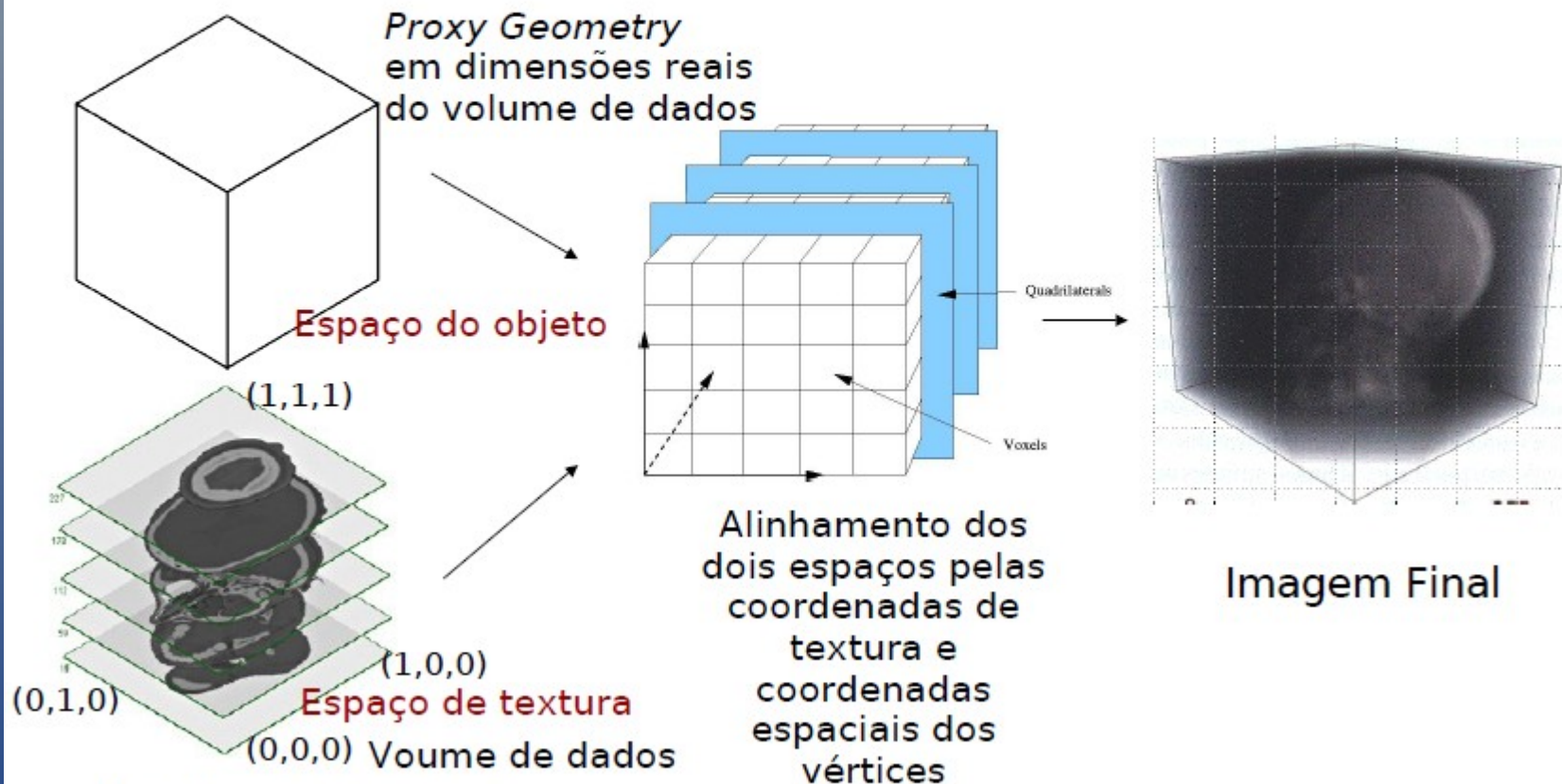
Tópicos em Engenharia de Computação VI

Método de Visualização Volumétrica

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Texturização 3D

- “Texturizar” um cubo (*proxy geometry*) com o volume de dados de interesse



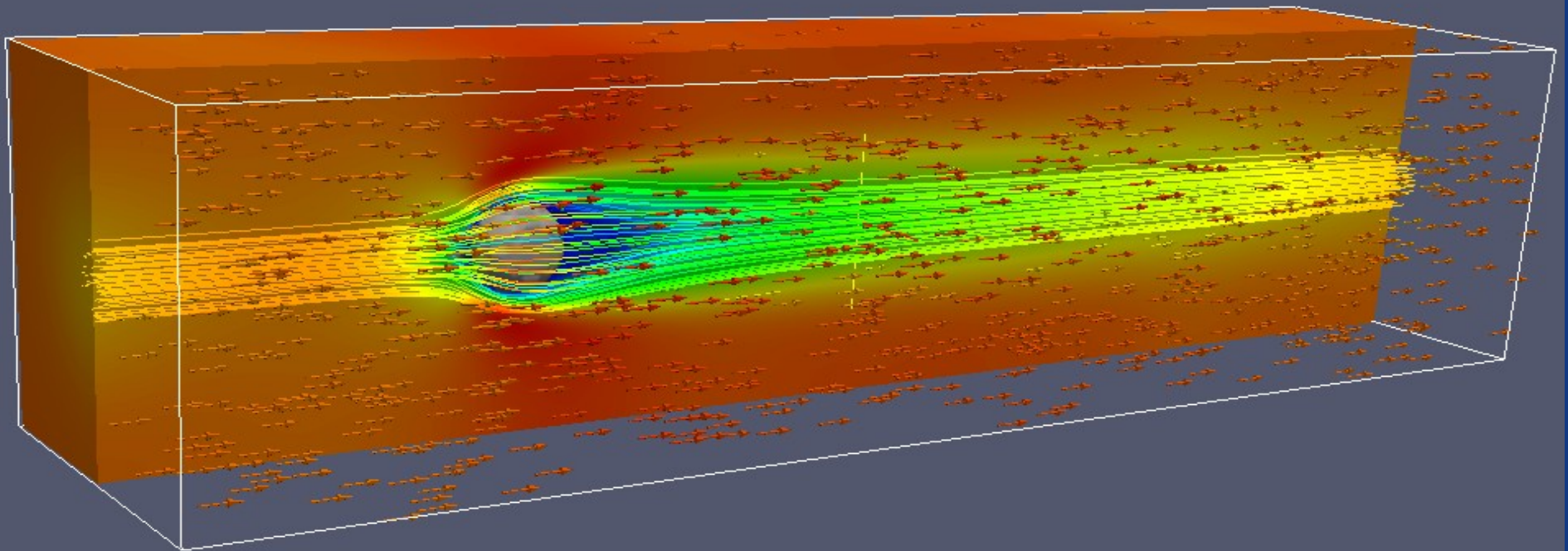
Texturização 3D

- ▮ Método dominante para representação volumétrica em GPUs
- ▮ Necessita apenas de suporte à textura e à *blending* (mistura) para composição
- ▮ Amplamente disponível e bastante eficiente
- ▮ Desvantagem: restrito a malhas uniformes (não se aplica)

Line Integral Convolution (LIC)

- Técnica proposta por Brian Cabral e Leith Leedom para visualizar o movimento de fluidos
- Em técnicas de integração mais simples, segue-se o vetor de fluxo em cada ponto para produzir uma linha
- Em LIC, produz-se uma imagem inteira a cada passo
- Método da família da advecção de textura (não são necessários “pontos de semente”)

Paraview



Imaging Vector Fields Using Line Integral Convolution [1]

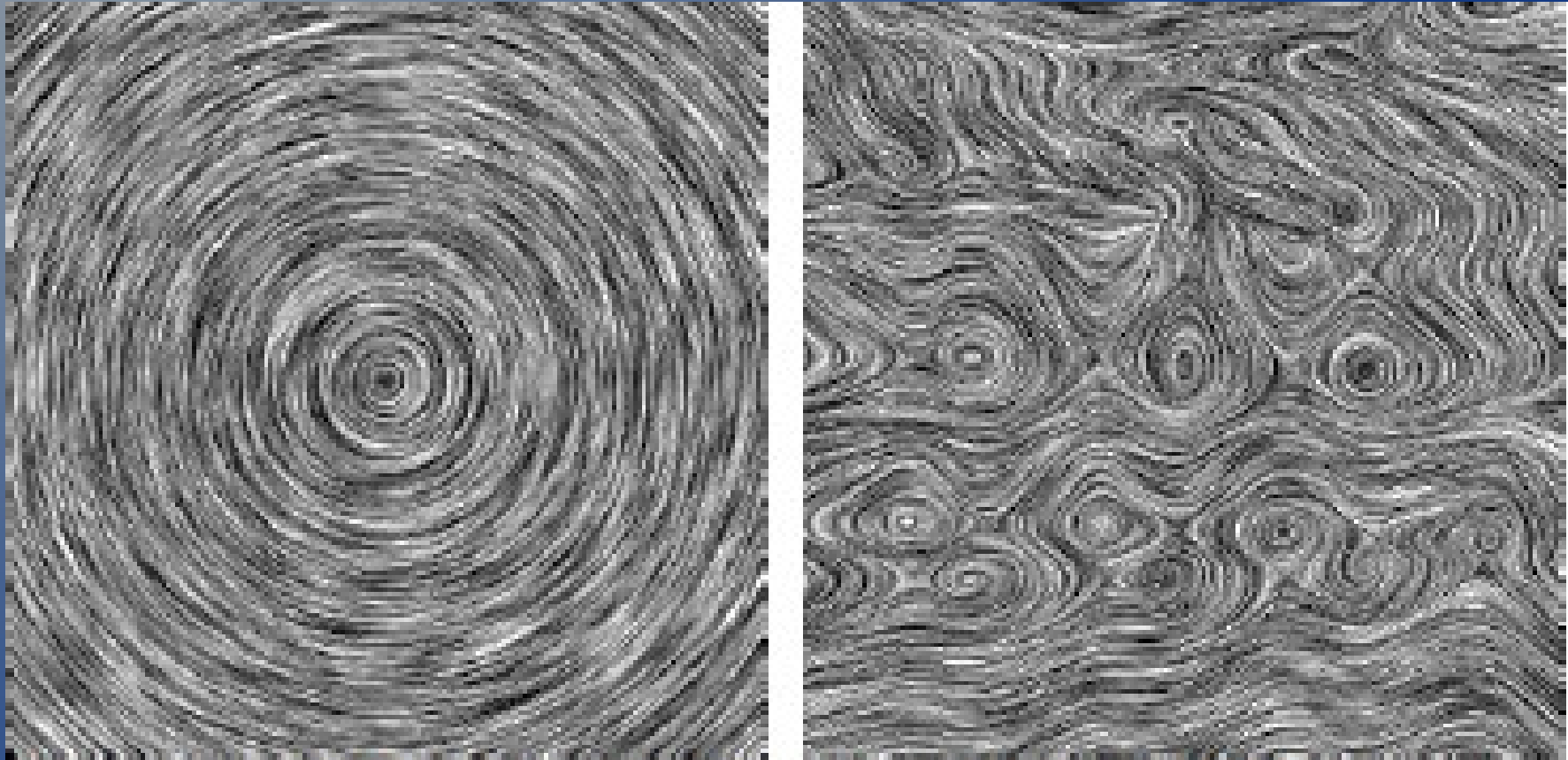


Figure 4: Circular and turbulent fluid dynamics vector fields imaged using LIC over white noise.

Imaging Vector Fields Using Line Integral Convolution [1]

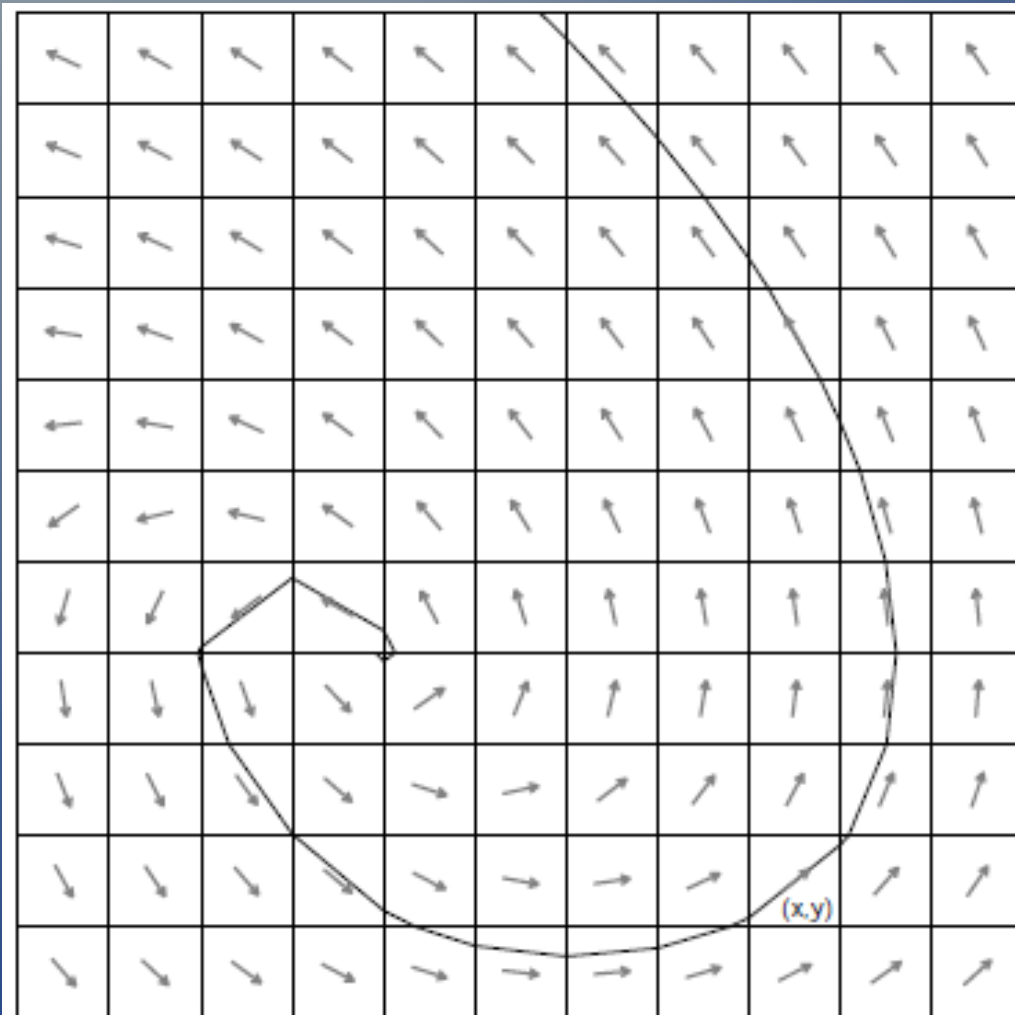


Figure 3: A two-dimensional vector field showing the local stream line starting in cell (x, y) . The vector field is the upper left corner of the fluid dynamics field in figures 2 and 4.



Figure 12: A photograph (top) of the Flavian Amphitheater is used to create a vector field. The field is then used to image a "painted" version of the same photograph (bottom).

The Lattice-Boltzmann Method on Optimal Sampling Lattices [2]

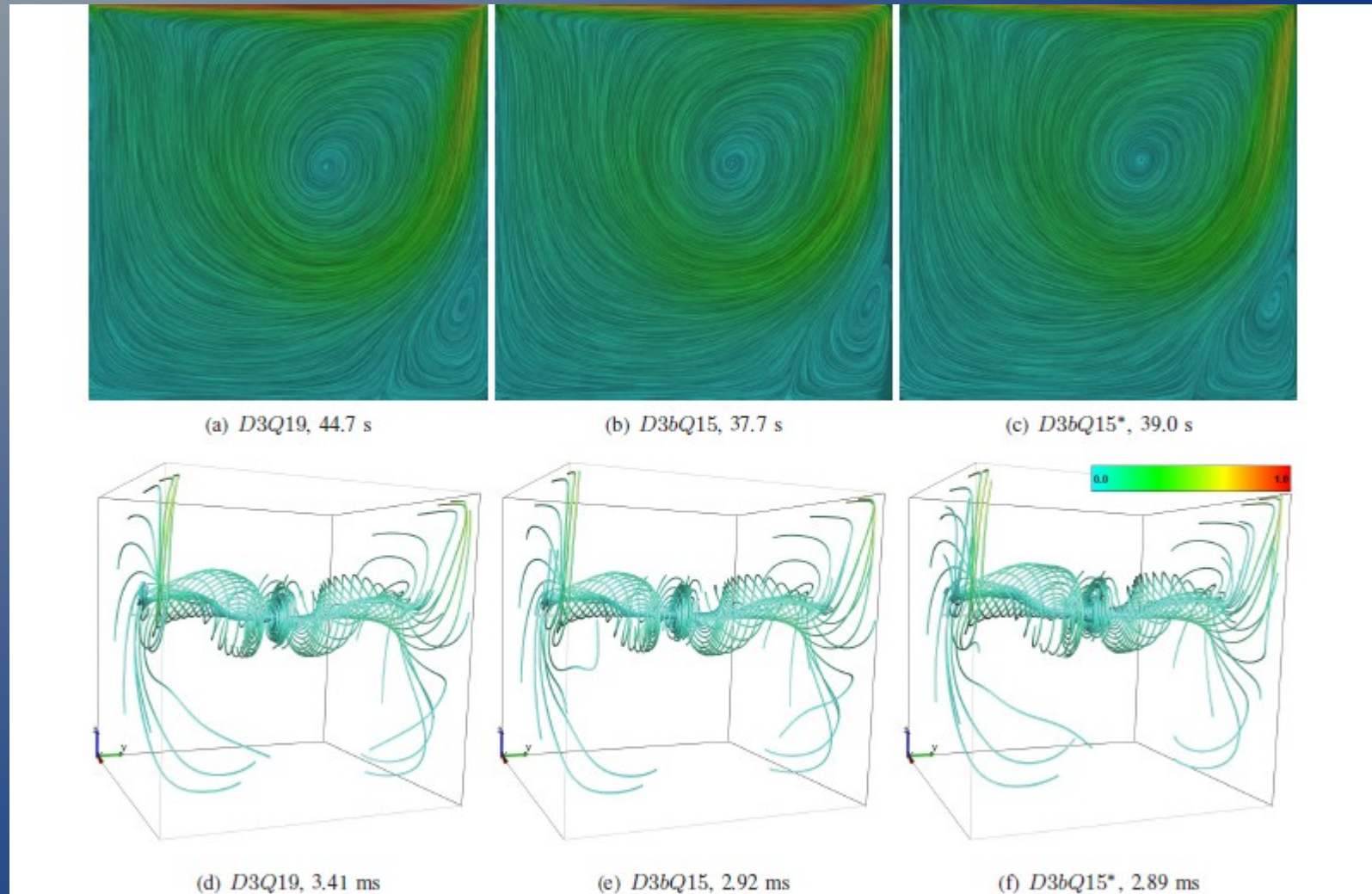


Fig. 8. LIC and streamline images at $Re = 1000$ and $L = 96$. The LIC images (a), (b) and (c) illustrate the flow on the xz plane in the center of the cavity. The timing data indicates computation time averaged over ten runs. Streamline images (d) (e) and (f) show the flow around the primary vortex. As illustrated, a line source is used to seed the streamlines. Please refer to the accompanying supplemental material for animations showing streamlines emanating from the line source as it moves through the cavity. The timing data indicates the average streamline computation time per line.

The Lattice-Boltzmann Method on Optimal Sampling Lattices [2]



(a) $Re = 300$



(b) $Re = 400$

Fig. 10. Three frames of simulations conducted on $D3bQ15$ using a higher grid resolution of $56 \times 28 \times 361$.

Output-Sensitive 3D Line Integral Convolution

<http://www.vis.uni-stuttgart.de/texflowvis/3dlic/>

Referências

- [1] Cabral, B., Leedom, L. **Imaging Vector Fields Using Line Integral Convolution.**
- [2] Alim, U., Entezari A. and Möller T. **The Lattice-Boltzmann Method on Optimal Sampling Lattices.** Ieee Transactions On Visualization And Computer Graphics, Dezembro 2008.