Real-time flow-noise

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Evasion workgroup - June 8th, 2006
Real-time flow-noise

- State of the art
- Improved animated Perlin noise
- GPU implementation
Real-time flow-noise

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State of the art

- Procedural textures
- Definition
- Advantages
- Animation issues
- Time and space continuity
State of the art

- (more than) **An example : Perlin noise**
- **1D :**
State of the art

- (more than) **An example: Perlin noise**

- **2D:**

![Perlin noise visualization](image-url)
State of the art

- Texturing fluids
  - flowing and swirling i.e. turbulence
- Flownoise
  - rotate gradients
- Advected textures
  - texture coordinates ‘follow’ the fluid
  - stretching, regeneration, latency
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Improved animated Perlin noise

• Continuous displacement with respect to a rotation field generates rolling-up

Comparaison des différentes méthodes d'interpolation sur une texture structurée et sur un bruit de Perlin

Texture non déformée

Interpolation du déplacement

Interpolation du résultat
Improved animated Perlin noise

*Comparaison des différentes méthodes d'interpolation sur une texture structurée et sur un bruit de Perlin*

- give up spatial continuity
- noise properties hide it

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Improved animated Perlin noise

- Control rotation spectrum
  - Kolmogorov law: $E(k) = C_k e^{-2/3} k^{4/3}$
  - our discrete version: $W_j \Omega_j^2 \sim k_j^{4/3}$
  - relation between scale, weight and rotation speed
  - still degrees of freedom / control!
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• GPU implementation
GPU implementation

- Artifacts due to noise structure
- Add offset between different scales
GPU implementation

- Precision issues for texture coordinates
- fp16 vs fp32
• Overview
GPU implementation

- **Shader statistics:**
  - 20 R-regs, 14 H-regs
  - 771 instructions
  - 48 COSH, 48 SINH, 74 TEX

- **Results**
  - >25Hz, 400x400 (QuadroFX 1400)
GPU implementation

- Video
Real-time flow-noise

• Conclusion
  • simple and artifact-free algorithm
  • real-time on GPU
• Ideas for future research
  • procedural texture coordinates and rotation values
  • create heightfields, possibly with LOD
  • progressive texture update
• Any questions?