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Chapter 4

Transform-based compression of fluid subspaces

In the previous chapter, we discussed the potential for subspace methods to accelerate the computational cost of physics-based simulations. However, a significant drawback of the subspace approach is the time/memory tradeoff: the speed increase comes at a cost of much larger memory requirements. Specifically, subspace simulations can easily consume dozens of gigabytes of memory when dealing with high-resolution scenes. In this chapter, we discuss a compression method to reduce the memory footprint of subspace methods by an order of magnitude.

4.1 Previous Work

Since memory consumption is a known challenge with subspace techniques, other research has focused on reducing the memory footprint of these simulations. In the applications of sound [1] and blendshape matrices [2], compression techniques have been developed; however, we are unaware of analogous research in subspace fluid

simulation. In the work of Wicke et al. [3], a modular fluid basis is used that can be tiled throughout the domain. However, our approach is complementary, as the modular tiles themselves could be further compressed by applying our algorithm.

Bibliography

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