Wave curves: Simulating Lagrangian water waves on dynamically deforming surfaces

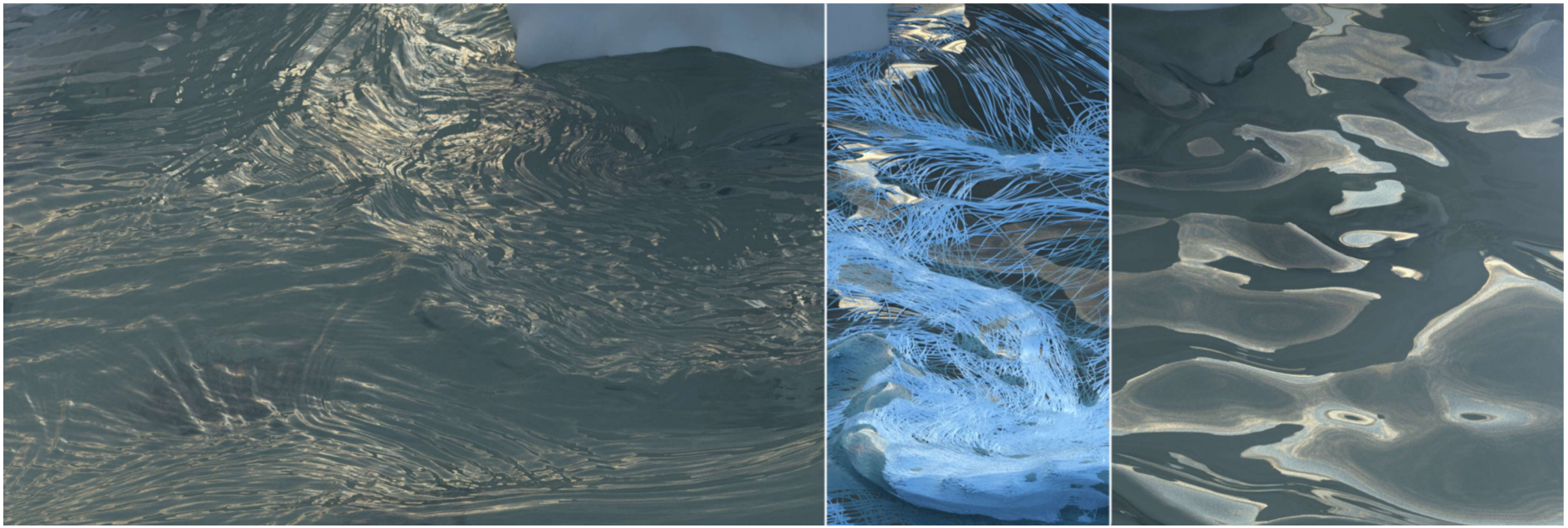
Sergei Sotnikov

February 10, 2022

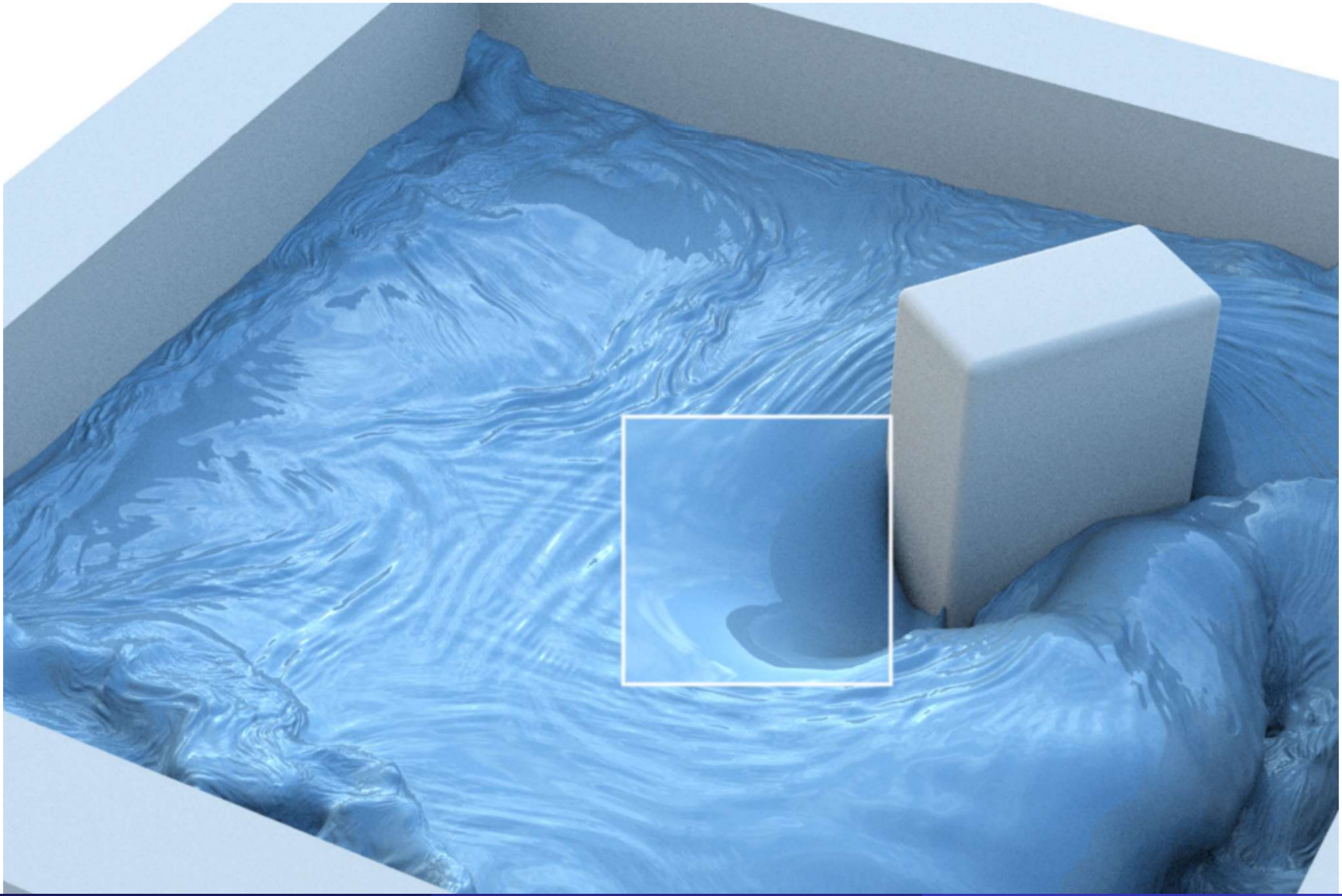
Purpose

- This method is used to enhance visual details of surface water simulations.
- Instead of simulating water using a large number of particles, it uses wave curves to improve quality.
- Can be used to enhance core simulation
- Linear execution time with respect to curve points

Wave curves



Comparison



Math

$$\frac{\partial E}{\partial t} + div((U + c_g)E) = \frac{E}{\sigma}(-\frac{c_g}{c_p}) * D + \frac{1}{\sigma}\frac{\partial \Omega}{\partial g}\frac{Dg}{Dt}$$

Limitations

- Small wave amplitude
- Small wave length
- Can't add intrusive changes to the base simulation
- Slowly changing environment

References

Tomas Skrivan, Andreas Soderstrom, John Johansson, Christoph Sprenger, Ken Museth, and Chris Wojtan. 2020. Wave curves: simulating lagrangian water waves on dynamically deforming surfaces. ACM Trans. Graph. 39, 4, Article 65 (August 2020), 12 pages.
DOI:https://doi.org/10.1145/3386569.3392466