Errata for Wave Curves: Simulating Lagrangian water waves on dynamically deforming surfaces

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This document should serve as a supplement to the original article "Wave Curves" article [Skrivan et al. 2020]. One of the test scenes in the original paper used an incorrect parameter setting, so we correct the results here in Section E1. Also, we add clarification for some ambiguous notation in Section E2.

E1 EFFECTIVE GRAVITY IN "PADDLE" SCENE

The simulations of the "paddle" scene in [Skrivan et al. 2020] have a parameter set incorrectly. Instead of using our proposed effective gravity g^*, these examples only use the fixed gravity g. To rectify this mistake, the authors re-ran the simulations with the effective gravity enabled. We provide corrected figures here, and we provide corrected animations in the supplementary files accompanying this document.

Figure E1 in this paper should replace Figure 8 in the original paper. It shows the difference between a low-resolution simulation with only 100k wave curve points, compared to a detailed simulation with 800k curve points. These images have fewer visible waves compared to the original paper, because the modified effective gravity causes different wave seeding and decay rates in the simulation.

Figure E2 in this paper should replace Figure 9 in the original paper. It shows a simulation with effective gravity enabled and how it looks with only a single wavelength simulated. We do not see a significant qualitative difference between these simulations and those of the original paper.

Figure E3 in this paper should replace Figure 12 in the original paper. It shows the comparison between our seeding and random seeding, with effective gravity enabled. The differences between the two simulations are still very clear — our method produces more waves that align with the flow, while random seeding produces random wave orientations before the geometric stretching of the flow naturally destroys poorly-aligned waves. The only difference between the seeding in the original paper and this one is the effective gravity term in the growth equation:

$$G(\boldsymbol{x},\boldsymbol{k}) = \frac{1}{\sigma}\left(-\frac{c_g}{c_p}\hat{\boldsymbol{k}}\cdot\mathbb{D}\hat{\boldsymbol{k}} + \frac{1}{\sigma}\frac{\partial\Omega}{\partial g^*}\frac{Dg^*}{Dt}\right). \tag{E1}$$

Since we do not see an obvious change between the seeding with effective gravity toggled on or off, we believe that the first term (based on alignment with the velocity field) is more important for seeding than the second term (based on effective gravity), at least in these types of environments with mostly calm water.

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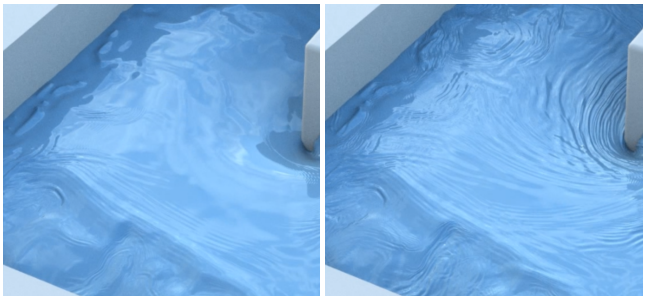

Fig. E1. Difference between simulations with 100,000(left), and 800,000 (right) wave curve points.

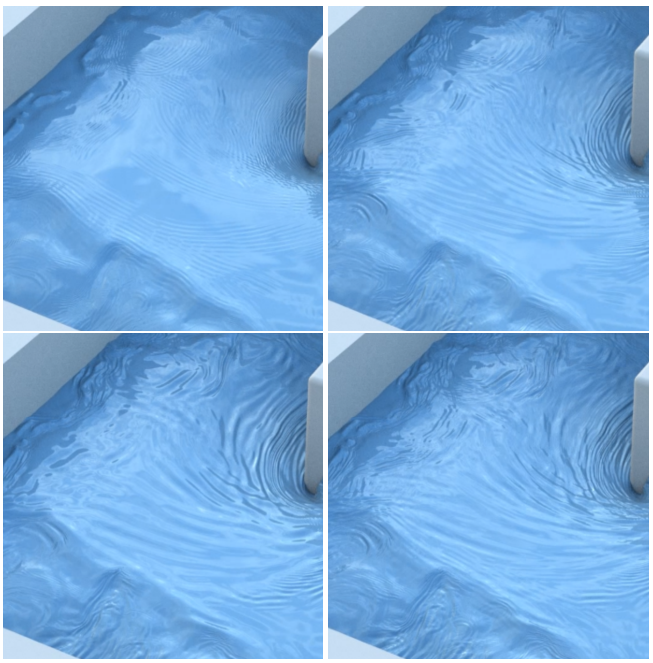

Fig. E2. Simulations where only waves of a single wavelength are generated: 5cm(top left), 10cm (top right), 20cm (bottom left). The last image shows a simulation of all of these wavelengths simultaneously.

E2 AMBIGUOUS NOTATION

Throughout most of the paper, Skrivan et al. [2020] use the variables a and $\boldsymbol{a}$ to indicate the *acceleration* experienced by a wave packet.

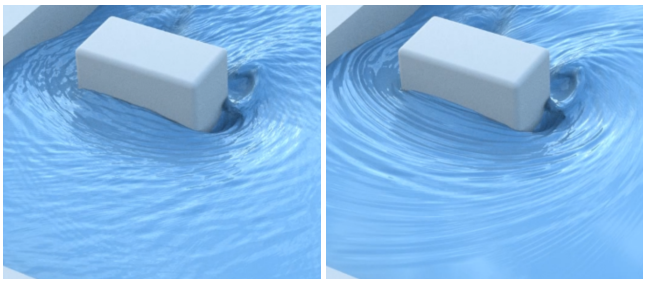

Fig. E3. A simulation with random seeding (left) and our proposed seeding strategy based on energy growth rates (right). The random approach generates a noisy collection of many small waves throughout the surface. Our approach exhibits coherent waves aligned with the underlying fluid motion.

However, Equation 25 also uses the variable a to mean the *area* allocated to a wave packet. In order to avoid confusion, we can use the variable $\mathbb{A}$ to mean the wave packet area, replacing Equation 25 with:

$$\mathcal{A}_i^{n+1} = \mathcal{A}_i^n \frac{\mathbb{A}_i^n}{\mathbb{A}_i^{n+1}}. \tag{E2}$$

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 Transactions on Graphics (TOG)* 39, 4 (2020), 65–1.