

# Researchers use multigrid method to dramatically speed up cloth simulation

October 31 2015

---



Simulating the behavior of clothing and other fabrics in animated films requires animators to make tradeoffs between a realistic look and a reasonable amount of computing time. Researchers at Walt Disney Animation Studios now have developed a method that can shift the balance toward greater realism.

The Disney scientists used multigrid, a popular approach for large-scale numerical simulations, and, in particular, a special type known as smoothed aggregation. This approach enabled them to achieve speedups six to eight times faster than conventional methods for simulating a fully clothed character as he walked and ran.

"The more unknowns there are in the equations, the more advantageous this is going to be," said Rasmus Tamstorf, senior research scientist. The approach actually works more efficiently on large problems than small problems, making it especially suitable for simulations requiring lots of detail, such as the clothing worn by a main character or fabrics that appear in the foreground of a scene, he added.

Tamstorf and his collaborators, Toby Jones, senior software engineer, and Stephen McCormick, a professor emeritus of applied mathematics at the University of Colorado, Boulder, will present their findings at ACM SIGGRAPH Asia 2015, the Conference on Computer Graphics and Interactive Techniques, Nov. 2-5, in Kobe, Japan.

Multigrid methods, which have been around for decades, are an approach to solving large problems by first solving a less detailed, coarser version of the problem. This process occurs recursively, with the problem made coarser and coarser until it can be solved easily. "Then you work your way back up," Tamstorf said, using each solution to guide the solution of the next, more complex version of the problem.

"The idea is not new; other people have tried to use geometric multigrid methods for cloth simulation," Tamstorf said. But these attempts often have failed to produce big increases in efficiency, and are more restrictive in how they can be applied.

One reason is because of the inherent physics of cloth, he explained. When a piece of material is stretched, for instance, it not only gets

longer in one direction, but also compresses, or gets narrower, in the perpendicular direction. This property proves to be difficult to handle for geometric multigrid methods.

The smoothed aggregation technique the Disney team adopted is an algebraic method designed to handle the coupling between directions. "Smoothed aggregation allows a lot more flexibility," Tamstorf said, noting it works with any type of mesh and handles contact constraints seamlessly.

Jessica Hodgins, vice president of research at Disney Research stated, "In addition to film animation, smoothed aggregation multigrid methods could be used in e-commerce to allow customers to try on clothing virtually."

**More information:** "Smoothed Aggregation Multigrid for Cloth Simulation-Paper" [[PDF, 8.48 MB](#)]

Provided by Disney Research

Citation: Researchers use multigrid method to dramatically speed up cloth simulation (2015, October 31) retrieved 9 April 2024 from <https://phys.org/news/2015-10-multigrid-method-simulation.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--