Multimaterial Mesh-Based Surface Tracking

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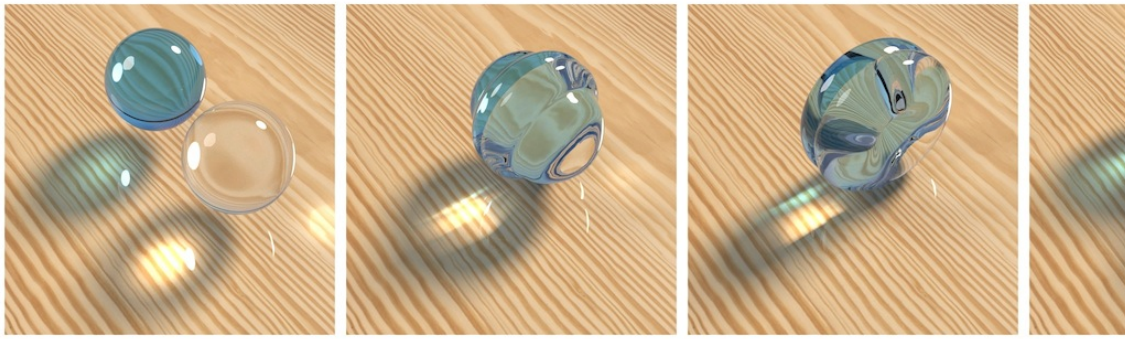

Abstract

We present a triangle mesh-based technique for tracking the evolution of three-dimensional multimaterial interfaces undergoing complex deformations. It is the first non-manifold triangle mesh tracking method to simultaneously maintain intersection-free meshes and support the proposed broad set of multimaterial remeshing and topological operations. We represent the interface as a non-manifold triangle mesh with material labels assigned to each half-face to distinguish volumetric regions. Starting from proposed application-dependent vertex velocities, we deform the mesh, seeking a non-intersecting, watertight solution. This goal necessitates development of various collision-safe, label-aware non-manifold mesh operations: multimaterial mesh improvement; T1 and T2 processes, topological transitions arising in foam dynamics and multi-phase flows; and multimaterial merging, in which a new interface is created between colliding materials. We demonstrate the robustness and effectiveness of our approach on a range of scenarios including geometric flows and multiphase fluid animation.

Files

Paper: [PDF]

Low res: [PDF]

Video: [MP4]

Supplemental [PDF]

material: [Columbia Academic Con
Technical report:
Source: [C++] [Github]

BibTeX

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@article{dbg14,
    author = "Fang Da and Christopher Batty and Eitan Grinspun",
    title = "Multimaterial Mesh-Based Surface Tracking",
    journal = {ACM Trans. on Graphics (SIGGRAPH 2014)},
    year = 2014
}
```

This work was supported in part by the NSF (Grants IIS-1319483, CMMI-1331499, IIS-1217904, IIS-1117257, CMMI- 1129917, IIS-0916129), the Israel-US Binational Science Foundation, the Natural Sciences and Engineering Research Council of Canada (NSERC), Intel, The Walt Disney Company, Autodesk, Side Effects Software, NVIDIA, and the Banting Postdoctoral Fellowships program. We would like to thank Brochu et al. for releasing the El Topo source code [Brochu and Bridson 2009; Brochu et al. 2012], which helped to make our work possible. We would also like to thank Henrique Teles Maia, Nora Wixom and Rohan Sawhney for their assistance with the work.

Updated: July 29, 2014