

Design mockup

https://unfoldresearch.com/mockup

CiteSaveDownload

▲

Monte Carlo Geometry Processing: A Grid-Free Approach to PDE-Based Methods on Volumetric Domains

▼

9 projects

7 reviews

16 mentions

2.3k views

Authors

Rohan SawhneyKeenan Crane

Published

2020

Abstract

This paper explores how core problems in PDE-based geometry processing can be efficiently and reliably solved via grid-free Monte Carlo methods. Modern geometric algorithms often need to solve Poisson-like equations on geometrically intricate domains. Conventional methods most often mesh the domain, which is both challenging and expensive for geometry with fine details or imperfections (holes, self-intersections, etc.). In contrast, grid-free Monte Carlo methods avoid mesh generation entirely, and instead just evaluate closest point queries. They hence do not discretize space, time, nor even function spaces, and provide the exact solution (in expectation) even on extremely challenging models. More broadly, they share many benefits with Monte Carlo methods from photorealistic rendering: excellent scaling, trivial parallel implementation, view-dependent evaluation, and the ability to work with any kind of geometry (including implicit or procedural descriptions). We develop a complete “black box” solver that encompasses integration, variance reduction, and visualization, and explore how it can be used for various geometry processing tasks. In particular, we consider several fundamental linear elliptic PDEs with constant coefficients on solid regions of  $R^n$ . Overall we find that Monte Carlo methods significantly broaden the horizons of geometry processing, since they easily handle problems of size and complexity that are essentially hopeless for conventional methods.

Linked:

3 projects

Files

paper.pdf

2 weeks ago18MB

WoSLaplace2D.cpp

2 weeks ago3KB

WoSPoisson2D.cpp

2 weeks ago3KB

fiaures

AddendumsReplicationReviewsRelatedAnalytics

Post a review

you haven't posted a review yet.

pre-publication reviews

▲

17

posted 8 days ago by Anonymous (journal review)

High QualityCorrect

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore mag Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidate

▲

4

posted 4 days ago by Anonymous (conference review)

OriginalCorrect

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore mag Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidate

post-publication reviews

▲

8

posted 5 days ago by Inigo Quilez 14,290

DistinguishedHigh QualityOriginalCorrectGood DataGood ExamplesTechnical

This is an excellent paper offering completely original take on the sphere tracing and PDE interpolation of open an shapes and surfaces, thus extending the potential application to rendering 2d and 3d outlines, volumetric rendering effects and many more.

Linked: 1 publication3 projects1 note

▲

8

posted 2 days ago by Sébastien Lagarde 9,620

High QualityOriginalCorrectGood ExamplesTechnical

Authors offer a glimpse into a new alternative for offline and online rendering. Exciting opportunities that rise from ipsum dolor sit amet lorem ipsum dolor sit amet lorem ipsum dolor sit amet lorem ipsum dolor sit amet

Linked: 2 notes

▲

7

posted 3 days ago by Eric Heitz 12,834

DistinguishedHigh QualityOriginalCorrectGood ExamplesGood DataTechnical

Incredible creativitv and originalitv are presented in newest paper by the authors Sawhnev and Crane. A new twist c