Yogesh Haribhau Kulkarni • You
AI Advisor (Helping organizations in their AI journeys) | PhD (Geometric Modeling) | Tech Colum...
now •

Any experts in mathematical geometric modeling! 📝💡

I'm looking for folks with a strong, formal and higher-level background in mathematics to review my previously published paper and help identify gaps that could lead to new research opportunities. 📚

If you have a solid understanding of Euler-Poincare equations, Betti numbers, and are passionate about tackling challenging problems, I'd love to collaborate with you! 💬 The goal is to develop transformation equations for dimension reduction operations from solid to surface.

You can find the original paper here: **https://lnkd.in/dQiQn9Qz**

I've already received a preliminary critical review from **Perplexity** and **OpenAI**-ChatGPT Deep Research, which is now an open issue on **GitHub**: **https://lnkd.in/d8ttiuHZ**

If you're interested in contributing to this issue voluntarily, let me know and we can discuss further! 💬

#geometricmodeling #mathematics #researchopportunities #collaboration #midsurf #phd #mvpbuzz #gde

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Topological Validation of Midsurface Computed from Sheet Metal Part

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ABSTRACT

During the initial stages of iterative design process, a quick CAE (Computer-aided Engineering) analysis of the CAD (Computer-aided Design) models is needed. To reduce the computational resources and time needed for such analysis, the models are often simplified by removing the irrelevant details and are abstracted by reducing the dimension, wherever appropriate. Thin-walled parts, such as sheet metal parts are often abstracted to a set of surfaces lying midway, called mid-surface. The mid-surface is expected to mimic the shape of the original solid, both geometrically and topologically. Widely-used methods of accessing the quality of the mid-surface are geometric. Hausdorff distance from the mid-surface its original solid is computed to find the gaps and medial-ness. Accuracy of such methods depends on the sampling as well as on the complexity of the surface representation, making them computationally intensive and error-prone.

This paper provides a topological method for verification, which is computationally simple and robust. A novel topological transformation relationship has been derived between a sheet metal part (solid) to its mid-surface (surface), in both directions (solid-to-surface and surface-to-solid) which can be used to compare the predicted vs actual entities. Simple as well as practical shapes have been tested to prove the efficacy of the newly-derived formulation.

Keywords: CAD, CAE, topology, Euler characteristics, Betti numbers, sheet metal parts, mid-surface, cellular decomposition