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Peer Review

Review of: "Towards End-to-End Neuromorphic Voxel-based 3D Object Reconstruction Without Physical Priors"

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The article introduces a novel approach to 3D object reconstruction utilizing neuromorphic voxel-based processing, eliminating the need for physical priors. By leveraging event-based data and a tailored neural network architecture, the proposed method aims to achieve efficient and accurate 3D reconstructions. The study presents experimental results demonstrating the effectiveness of this approach in various scenarios.

While the proposed method addresses key challenges in 3D object reconstruction, the paper would benefit from a more detailed justification of design choices, particularly concerning the selection of neural network architectures and the handling of event-based data. Additionally, an analysis of the computational overhead introduced by the neuromorphic processing would provide a clearer understanding of its practical implications. A discussion on potential limitations and areas for future research would further strengthen the manuscript.

My feedback points & concerns are summed up as follows:

- The choice of neural network architecture should be better justified. How does it compare with other architectures in terms of performance and efficiency for event-based data processing?
- The method of processing and integrating event-based data into the reconstruction pipeline should be elaborated. How are noise and redundancy managed in the event streams?
- The computational requirements of the proposed neuromorphic approach should be analyzed. Does the method achieve real-time performance, and how does it scale with increasing data complexity?

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- A comparative analysis with existing 3D reconstruction methods, both traditional and neuromorphic, would provide context for the improvements achieved by the proposed approach.
- The ability of the method to generalize across different object types and complexities should be evaluated. Are there limitations in reconstructing objects with intricate geometries or varying textures?
- The paper does not explicitly discuss scenarios where the method may struggle. Identifying and analyzing failure cases would provide a more comprehensive understanding of the method's robustness.
- While the study presents promising results, outlining potential avenues for future research, such as enhancing reconstruction accuracy or extending the approach to dynamic scenes, would be beneficial.
- Some sections of the paper could be more clearly articulated. For example, the description of the neural network training process lacks detail. Providing a more thorough explanation would enhance reader comprehension.
- Please ensure that all mathematical notations and terminologies are used consistently throughout the manuscript to avoid confusion.

In summary, the paper presents a significant advancement in neuromorphic 3D object reconstruction techniques, but would be improved by deeper insights into parameterization, computational trade-offs, and future research directions.

Declarations

Potential competing interests: No potential competing interests to declare.