Robotic Vision Project:

matrix-free transformations using Projective Geometric Algebra (PGA) and pose interpolation within PGA

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Objective: To conduct a comparative analysis between Projective Geometric Algebra (PGA) for matrix-free transformations and traditional matrix-based methods, focusing on efficiency, computational cost, and ease of implementation in pose interpolation tasks.

Methodology:

1. **Literature Review:** Review of existing literature on PGA from bivector.net and and YouTube playlist to get an understanding of PGA and its applications in transformations and interpolations.
2. **PGA Implementation:** Implement matrix-free transformations using PGA to demonstrate basic transformations: rotations, translations, and scaling.
3. **Traditional Approach Implementation:** Implement similar transformations and pose interpolations using traditional matrix-based methods for a direct comparison.
4. **Comparative Analysis:** Compare PGA and traditional methods in terms of computational efficiency (time complexity), numerical stability, ease of implementation, and scalability.

Expected Outcomes:

- A comprehensive comparison between PGA and traditional matrix-based approaches, highlighting the advantages and potential limitations of PGA in specific applications.
- Insight into the practicality of adopting PGA over traditional methods in terms of performance improvements and ease of use.