Overview

In this paper we study the problem of automatically generating polynomial solvers for minimal problems. The main contribution is a new method for finding small elimination templates by making use of the syzygies (i.e. the polynomial relations) that exist between the original equations. Using these syzygies we can efficiently parameterize the set of possible elimination templates.

We evaluate our method on a wide variety of problems from geometric computer vision and show improvement compared to both handcrafted and automatically generated solvers. Furthermore we apply our method to previously unsolved relative orientation problems.

Background

• Systems of polynomial equations occur in many geometric vision problems.
• Most common method (in Computer Vision) is the

\[ \begin{aligned}
    f_1(x) &= 0 \\
    f_2(x) &= 0 \\
\end{aligned} 
\]

Solutions to (1) are then found by eigenvalue decomposition of the matrix

\[ C \in \mathbb{R}^{2m \times 2m} \]

where \( C \) is a constant matrix depending on the data and

\[ \mathbf{x} \in \mathbb{R}^n \]

is a constant vector.

Efficient Solvers for Minimal Problems by Syzygy-Based Reduction

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References


Code is available at http://www.maths.lth.se/~viktorl/