

# Solving systems of spline equations: A linear programming-based approach

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## ABSTRACT

For the past 25 years, the method of choice for solving tensor product spline systems of equations has been the projected polyhedron method of Sherbrooke and Patrikalakis [SP93]. Although the method can sometimes bog down and perform badly on certain problems, it has the virtue of being very robust, and its use has enabled many other robust algorithms for geometry processing to be developed on top of it, aided by a number of refinements published over the years (see [H14] and [MPR03]). One of the potential refinements discussed in [H14] is to use linear programming as a means of accelerating the performance of the algorithm. The author ultimately discards the idea as being too computationally expensive to be practical. This talk will explore this idea in more detail than was done in [H14] and suggest that, once one takes advantage of special problem structure arising in large numbers of applications, the method may prove to be computationally competitive after all.

## References

- [H14] Hanniel, I. “Solving multivariate polynomial systems using hyperplane arithmetic and linear programming,” *Computer-Aided Design* **46**, pp. 101–109.
- [MPR03] Mourrain, B., V. Y. Pan, and O. Ruatta. “Accelerated solution of multivariate polynomial systems of equations,” *SIAM Journal of Computing* **32**, pp. 435–454.
- [SP93] Sherbrooke, E. C. and N. M. Patrikalakis. “Computation of the solutions of nonlinear polynomial systems,” *Computer Aided Geometric Design* **10**, pp. 379–405.