# Prony's method in several variables and oligonomials

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In 1795, R. Prony [2] gave an enginous trick to recover a function of the form

$$f(x) = \sum_{\omega \in \Omega} f_\omega e^{\omega^T x}, \qquad \Omega \subset \mathbb{C}^s, \ \#\Omega < \infty,$$

from integer samples by finding the zeros of a polynomial whose coefficients are in the kernel of the Hankel matrix

$$F = [f(\alpha + \beta) : |\alpha|, |\beta| \le n]$$

for large enough $n$, see [1] for a survey. To extend the method to several variables in such a way that it can be run in a floating point environment, it is convenient to use homogeneous H–bases, [3], which can be constructed "on the fly" from parts of the matrix $F$ by means of an orthogonal reduction process. The method can be easily extended to the recovery of *oligonomials*, i.e., sparse (multivariate) polynomials with only a few nonzero coefficients.

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## References

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[3] T. Sauer, *Gröbner bases, H–bases and interpolation*, Trans. Amer. Math. Soc. **353** (2001), 2293–2308.