

# COMPUTING APPROXIMATE VANISHING IDEALS OF FINITE SETS OF POINTS USING COCOA

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## EXTENDED ABSTRACT

In February 2005 the algebraic oil project's team introduced methods for numerical computations of approximate vanishing ideals of finite sets of points. First timings and examples were given, produced with a Matlab implementation.

Within the last year significant progress was made in the context of approximate vanishing ideals. The authors created a numerical framework within the CoCoALib and implemented the algorithms, introduced in [3], to compute approximate vanishing ideals. With version 0.98 of the CoCoALib (released on March 9th, 2007) this implementation became public under the GPL, version 2.

This theory was developed in the algebraic oil project and is also being applied to industrial-size problems. We think these methods may be useful and interesting for a broad audience. In this spirit, we want to give examples, show how to use CoCoA for approximate algebraic computations, and present timings, comparing the CoCoA-implementation with our initial Matlab code.

Besides this we would like to present some applications of approximate vanishing ideals.

## REFERENCES

- [1] the algebraic oil project: [http://www.mathematik.uni-dortmund.de/algebraic\\_oil/](http://www.mathematik.uni-dortmund.de/algebraic_oil/)
- [2] the CoCoA system: <http://cocoa.dima.unige.it/>
- [3] D. Heldt, M. Kreuzer, S. Pokutta and H. Poulisse, *Approximate computation of zero-dimensional polynomial ideals*, submitted.
- [4] D. Heldt, M. Kreuzer, S. Pokutta and H. Poulisse, *Algebraische Modellierung mit Methoden der approximativen Computeralgebra und Anwendungen in der Ölinindustrie*, OR News 28 (2006), S. 15-18 (german)
- [5] D. Heldt, S. Pokutta and H. Poulisse: *Algebraic Computations on Noisy, Measured Data*, Talk at Workshop B1: Approximate Commutative Algebra, Special Term on Gröbner Bases and related Methods, RICAM, Linz.

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