

Arnon, Dennis S.; Smith, Scott F.

Towards mechanical solution of the Kahan ellipse problem. I. (English) Zbl 0553.68031
Computer algebra, EUROCAL '83, Proc. Conf., London 1983, Lect. Notes Comput. Sci. 162, 36-44 (1983).

[For the entire collection see [Zbl 0532.00010](#).]

The authors present means for a speed-up of the Collins decision algorithm for the theory of the real closed fields [*G. E. Collins*, Lect. Notes Comput. Sci. 33, 134-183 (1975; [Zbl 0318.02051](#))]. The Collins algorithm may also be applied to solve the Kahan ellipse problem, i.e., to find a, b, c, d for which $(\forall x)(\forall y)((x - c)^2/a^2 + (y - d)^2/b^2 = 1 \rightarrow y^2 + x^2 < 1)$ holds, but proved to be inefficient in this case. Thus, the authors give a survey of the Collins method and discuss the necessity for a preprocessing of the formulas. Such a preprocessing may consist in the application of a simple rule in predicate logic, namely: $(\forall u)(\forall v)(F(u) = G(v) \rightarrow \phi(u, G(v)))$ implies $(\forall u)((\exists v)F(u) = G(v) \rightarrow \phi(u, F(u)))$. It is shown, that for the case $d = 0$ the Collins algorithm, applied to Kahan's ellipse problem, may be improved by this rule. Finally the authors propose a priori restrictions on free variables as a mean of improved by this rule. Finally the authors propose a priori restrictions on free variables as a mean of improvement.

Reviewer: [A.Leitsch](#)

MSC:

- [68W30](#) Symbolic computation and algebraic computation
- [68T15](#) Theorem proving (deduction, resolution, etc.) (MSC2010)
- [03C10](#) Quantifier elimination, model completeness and related topics
- [03B35](#) Mechanization of proofs and logical operations
- [12L12](#) Model theory of fields
- [12D15](#) Fields related with sums of squares (formally real fields, Pythagorean fields, etc.)

Cited in **2** Documents

Keywords:

[Collins decision algorithm](#); [real closed fields](#); [Kahan ellipse problem](#)