

Accepted Manuscript

Counterexample guided inductive optimization based on satisfiability modulo theories

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PII: S0167-6423(17)30216-2
DOI: <https://doi.org/10.1016/j.scico.2017.10.004>
Reference: SCICO 2152

To appear in: *Science of Computer Programming*

Received date: 2 February 2017
Revised date: 26 July 2017
Accepted date: 7 October 2017

Please cite this article in press as: R.F. Araújo et al., Counterexample guided inductive optimization based on satisfiability modulo theories, *Sci. Comput. Program.* (2017), <https://doi.org/10.1016/j.scico.2017.10.004>

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Highlights

- Novel counterexample guided inductive optimization approach. This work describes three novel algorithms of a counterexample guided inductive optimization approach based on SMT solvers: generalized (CEGIO-G) that can be used for any constrained optimization problem; simplified (CEGIO-S) that can be employed if information about the minima location is provided; and fast (CEGIO-F) that presents a significant speed-up, but it can only be employed for convex functions.
- Convergence Proofs. This paper presents proofs of convergence and completeness (omitted in Araújo et al.) for the proposed counterexample guided inductive optimization algorithms.
- SMT solvers performance comparison. The experiments are performed with three different SMT solvers: Z3, Boolector, and MathSAT. The experimental results show that the solver choice can heavily influence the method performance.
- Additional benchmarks. The benchmark suite is expanded to 30 optimization functions extracted from the literature.
- Comparison with existing techniques. The proposed technique is compared to genetic algorithm, particle swarm, pattern search, simulated annealing, and nonlinear programming, which are traditional optimization techniques employed for non-convex functions.

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