

# Z3-Inc-Z3++ in SMT-COMP 2025

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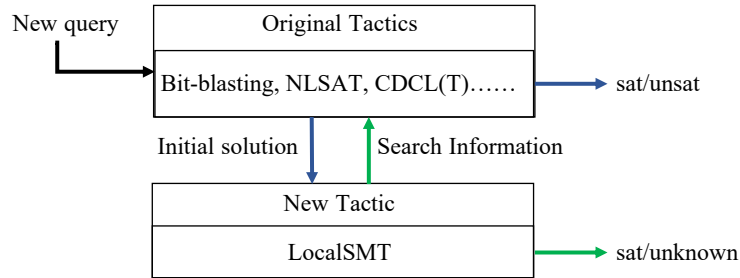
## 1 Introduction

Z3-Inc-Z3++ is a derived solver based on Z3 (version 4.13.4) [4]. This year, it participates in the incremental track of QF\_NIA. The usage is to run “./smt-comp\_run\_incremental” command in the uploaded archive <sup>3</sup>.

Z3-Inc-Z3++ belongs to the Z3++ family, which has participated in the SMT-COMP since 2022 [1]. An important feature of Z3++ is that it deeply integrates LocalSMT [2, 3, 5] as a new tactic. LocalSMT is a local search solver dedicated to SMT on arithmetic theories. Z3-Inc-Z3++ further extends the power of local search to incremental SMT queries.

## 2 Technical Innovations

The intuition is that the local search algorithm is specifically suitable for this incremental scenario: after a minor modification to the previous formula, a new solution can be found by simply modifying a few variables, and local search can effectively utilize the previous solution by modifying the current solution.



**Fig. 1.** Framework of Z3-Inc-Z3++

<sup>3</sup> <https://zenodo.org/records/15516426/files/new.zip>

Specifically, as shown in Figure 1, when the original tactics fail to solve the new query within the time limit in incremental mode, we shall utilize the historical solutions generated during previous “(check-sat)” queries and the formulas simplified by original tactics. Such information can be applied to generate an initial solution for the local search procedure, and LocalSMT tries to find a new solution nearby.

Moreover, on the other hand, the search information in the local search procedure can be applied to guide the heuristic for later queries in the original tactics [6]. Specifically, literals that frequently occur in unsatisfied clauses should be assigned earlier, in order to prune the search space. Decision heuristic can also refer to the truth assignment during the local search procedure.

Overall, the search information can be shared between the original tactics and the local search algorithm, so as to boost both search procedures.

### 3 Website

Further information can be found at  
<https://z3-plus-plus.github.io/>

### 4 Acknowledgments

We would like to thank the contributors of Z3.

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