Local Search For SMT on Linear Integer Arithmetic

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Application: Automated termination analysis, Sequential equivalence checking, State reachability checking, Job shop scheduling, etc.

Two mode Local Search Framework

Initialization

Integer Mode

Boolean Mode

Two-level picking heuristic

Candidate set of decreasing operation

A partial subset \( S \) \( \subseteq \) \( D \)

A set \( \{c_m(x_i, l)\} \) appears and at least one falsified clause

Fine grained scoring function: distance score

Distance to Truth literal: \( d(z) \)

Given an assignment \( a \) and an literal \( \sum x_k \leq k \)

Distance to satisfaction of clauses: \( d(z) \)

Given an assignment \( a \) and a clause \( C \)

Property: \( d(x, a) = 0 \) when \( C \) is satisfied

Distance function: \( d(x, a) > 0 \) when \( C \) is falsified

Critical move

Experiments

Combining with Z3: Z3+LS

Z3 running for 600s

LS-LIA