GEDIZ UNIVERSITY
izmir

Search-Based Parallel Refactoring Using Population-Based Direct Approaches

Hürevren KILIÇ
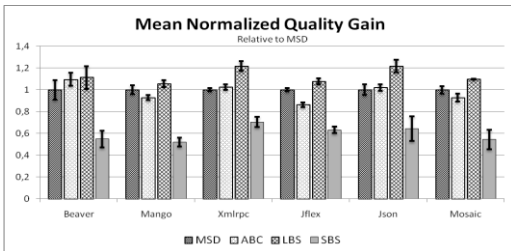Gediz University., Computer Engineering Dept., İzmir, TURKEY

Ekin KOÇ, İbrahim CERECİ
Atılım University, Computer Engineering Dept., Ankara, TURKEY
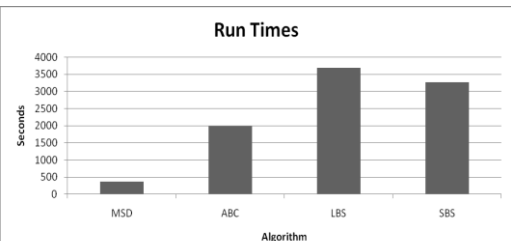
An Empirical Study

- Automated Refactoring: Candidate solution representation, Objective function desc., Functional behavior preservation.
- Multiple search vs. Population-Based search with introduced parallelism.
- Artificial Bee Colony search, Local Beam search, Stochastic Beam search, Multiple Steepest Descent search (as baseline).

Mean normalized quality gain values for MSD, ABC, LBS and SBS that are calculated relative to the baseline MSD search for all 6 input programs where food source size = beam size = 60 and number of ascents = 5.

Features and Assumptions

- 20 different refactoring actions.
- Adhoc quality model: Aggregation of 24 object-oriented metrics.
- Bytecode compiled Java codes as inputs.
- A-CMA: Developed in Java. Both standalone and   online versions
- Total number of independent runs taken:

  $$10 \times 6 \times (4 + 7 + 3 + 3) = 1020$$

- Use of ASM framework to extract design info.
- Ideal design set problem: Answer – packages from the base Java library !
- Considered packages: *java.lang, java.math, java.util, javax.swing*
- Search on normalized values.
- Hardware environment: 20 devices having Intel Core2DUO CPUs and 4GBs of memory.
- O/S: Ubuntu-Linux, fully ptchd with Sun JRE6.

Average execution time per run for MSD, ABC, LBS and SBS where food source size = beam size = 60 and number of ascents = 5.
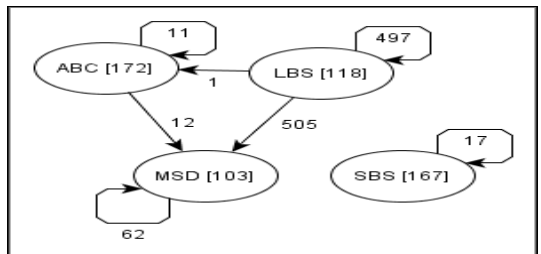
Pareto-front contributions based on the number of non-dominated superior designs (values inside nodes) and pairwise dominance results.

CONCLUSIONS: Best performed technique – **Local Beam Search** - with its high computation time requirement especially when beam size ≥ 60. **Artificial Bee Colony Search** – comparable results only for population size ≥ 200, scalable. Poor results for - **Stochastic Beam Search**.

The way to relatively better designs are mostly passing through relatively good ones.

FUTURE WORKS: Better design representation for higher quality results + Trial of alternative algorithms.