

# Survey of Approaches for Handling Static Analysis Alarms

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- Manual inspection of alarms
- Handling of alarms (HoA)
  - postprocessing of alarms
  - manual inspections of alarms
  - exclude improving analysis precision
- Approaches for HoA
  - differ greatly
  - not studied comprehensively before
- Research question
  - What are possible approaches for handling the static analysis alarms?

- Identifying relevant papers
  - **Keywords-based Database Search (KDS) + Snowballing**
- Inclusion criteria
  - a technique/method/approach to process the alarms
  - a method/tool-support for systematic manual inspections
  - an approach to report lesser number of alarms
- Exclusion criteria
  - improving precision of underlined analysis
  - fault prediction or error/bug report triaging
  - mining of bugs repositories (software maintenance/evolution)
  - study of economics or benefits of usage of static analysis tools
  - evaluation/comparison/benchmarking of precision/tools

# Keywords-based Database Search

- inspired by systematic literature reviews (SLRs)<sup>1</sup>

Table: Keywords used in database search

I	1) elimination, 2) reduction, 3) simplification, 4) ranking, 5) classification, 6) reviewing, 7) inspection
II	1) static analysis, 2) automated code analysis, 3) source code analysis, 4) automated defects detection
III	1) alarm, 2) warning, 3) alert

- Google Scholar
  - 84 =  $7 \times 4 \times 3$  different search strings.
  - 150 top results (total 12600 papers)
  - 49 papers relevant to HoA

<sup>1</sup>Barbara Kitchenham and Stuart Charters. "Guidelines for performing systematic literature reviews in software engineering". In: *EBSE Technical Report, Ver. 2.3 EBSE-2007-001 (2007)*.

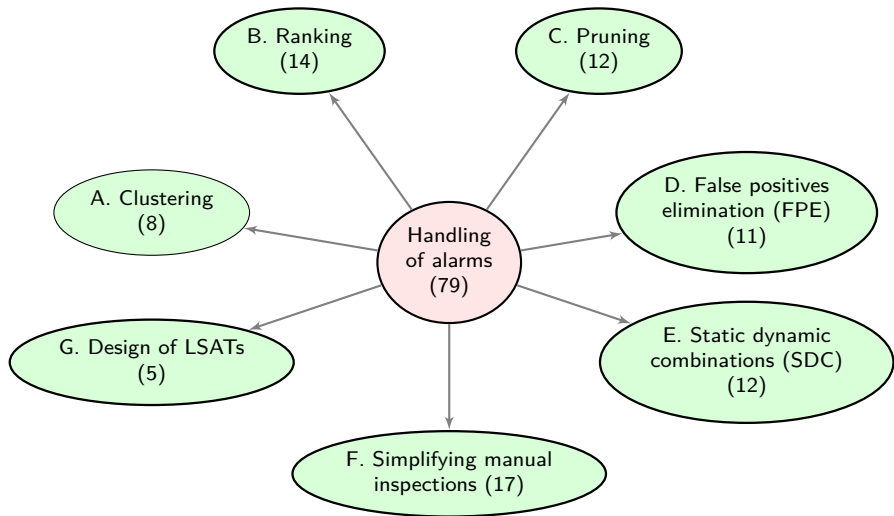
- Snowballing<sup>2</sup> after the KDS
  - incomplete search strings in KDS
  - snowballing is effective and efficient
- Snowballing details
  - Start set with 49 papers
  - 2 iterations
  - found 30 new relevant papers
- $49 + 30 = 79$  relevant papers
- KDS + Snowballing helped each other

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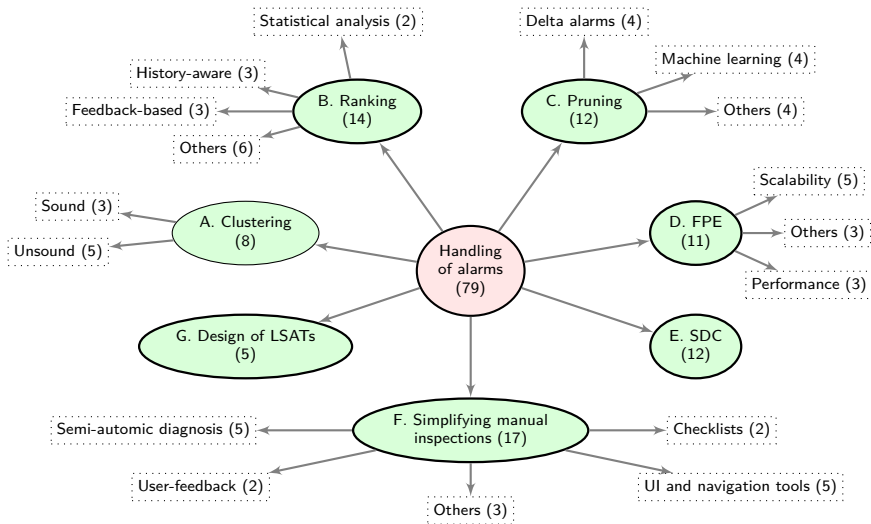
<sup>2</sup>Claes Wohlin. "Guidelines for Snowballing in Systematic Literature Studies and a Replication in Software Engineering". In: *EASE 2014*. ISBN: 978-1-4503-2476-2.

- Extracted data
  - approaches for HoA
  - techniques and artifacts used
  - tools and programming languages
  - available @  
<https://sites.google.com/site/scam2016paper/home/download>
- Classifying the approaches for HoA
  - open tagging
  - one approach per paper

# Classification of Approaches



# Classification of Approaches





# Year-wise Distribution

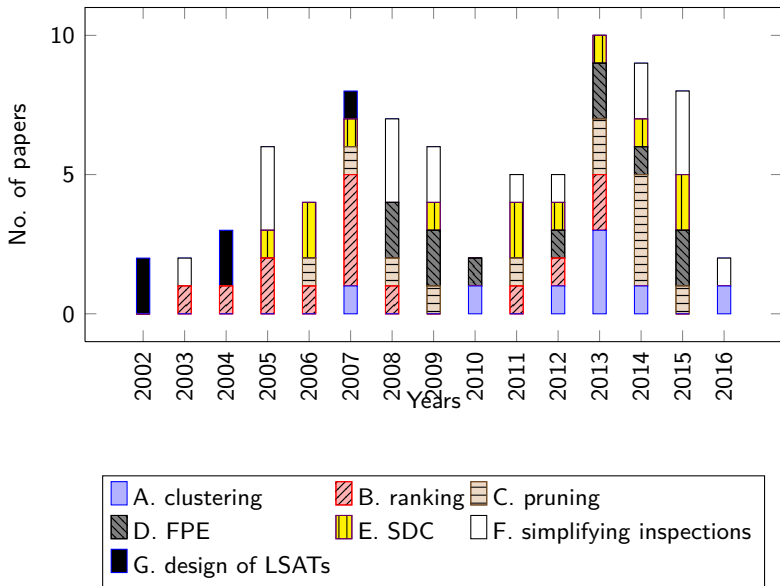


Figure: Number of the relevant papers published year- and category-wise

- Approaches having merits and demerits
  - complementary approaches
- Combinations of the approaches possible
  - examples
    - clustering  $\rightarrow$  ranking  $\rightarrow$  FPE
    - clustering  $\rightarrow$  pruning
  - ordering of the approaches
    - Pruning  $\rightarrow$  FPE or FPE  $\rightarrow$  Pruning ?
    - based on requirements in practice
  - parallelization of the approaches
    - to enhance the confidence
  - performance penalty to be studied

## Motivation

- What are possible approaches for handling the static analysis alarms?

## Literature Search

- Keywords-based Database Search (KDS) + Snowballing
- 79 relevant papers identified

## Data Extraction

- Seven categories of HoA
- Several sub-categories of the approaches

## Take-away Message

- Complementary approaches, and their combinations are possible and to be studied