Mopsa at the Software Verification Competition

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SyCoMoRES team

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ProgLang @ Inria
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Introduction

Conservative static program analysis

average.py

```python
def average(l):
  m = 0
  for i in range(len(l)):
    m = m + l[i]
  m = m // (i + 1)
  return s

r1 = average([1, 2, 3])
r2 = average(['a', 'b', 'c'])
```

TypeError: unsupported operand type(s) for '+': 'int' and 'str'

argslen.c

```c
#include <string.h>

int main(int argc, char *argv[]) {
  int i = 0;
  for (char **p = argv; *p; p++) {
    strlen(*p); // valid string
    i++; // no overflow
  }
  return 0;
}
```

No alarm

Specifications of the analyzer

Inference	of program properties such as the absence of run-time errors.
Semantic	based on a formal modelization of the language.
Automatic	no expert knowledge required.
Sound	covers all possible executions.

Towards Mopsa

Well-established & industrialized analysis of static programming languages

- C: Polyspace (1999), Astrée (2003), Frama-C (2008)
- Java: Julia (2010)
- JavaScript: Jensen, Møller, and Thiemann. “Type Analysis for JavaScript”. SAS 2009

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- Multiple languages?
- Common abstractions?
- Precision and configurability?

Outline

Mopsa

Overview of Mopsa

Modular **O**pen **P**latform for **S**tatic **A**nalysis[1]

`gitlab.com/mopsa/mopsa-analyzer`

Goals

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Contributors

- Antoine Miné
- Abdelraouf Ouadjaout
- Raphaël Monat
- *David Delmas*
- *Guillaume Bau*
- *Milla Valnet*
- Matthieu Journault

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Semantic property
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- Utility handling multi-file projects and compilation flags
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Work in progress

Analysis for recursive ADTs, presented at JFLAs last week by Milla Valnet.

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Presentation of SV-Comp (III)

Category	# tasks	Median loc.
ReachSafety	6282	1267
MemSafety	6280	86
ConcurrencySafety	2370	127
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Termination	3324	901
SoftwareSystems	5825	6655

Subcategories in SoftwareSystems

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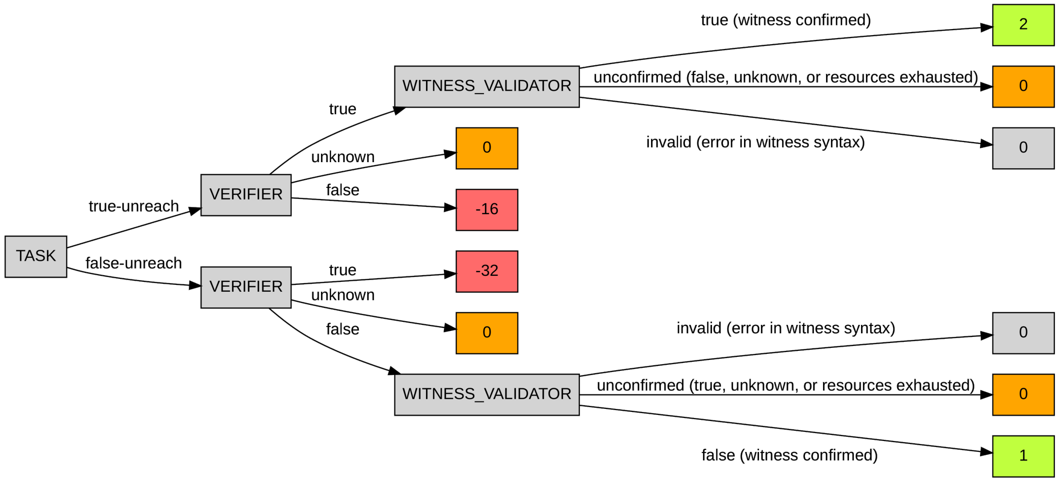
SV-Comp's Scoring System


TASK
true-unreach
false-unreach
VERIFIER
true
unknown
false
WITNESS_VALIDATOR
true (witness confirmed)
2
unconfirmed (false, unknown, or resources exhausted)
0
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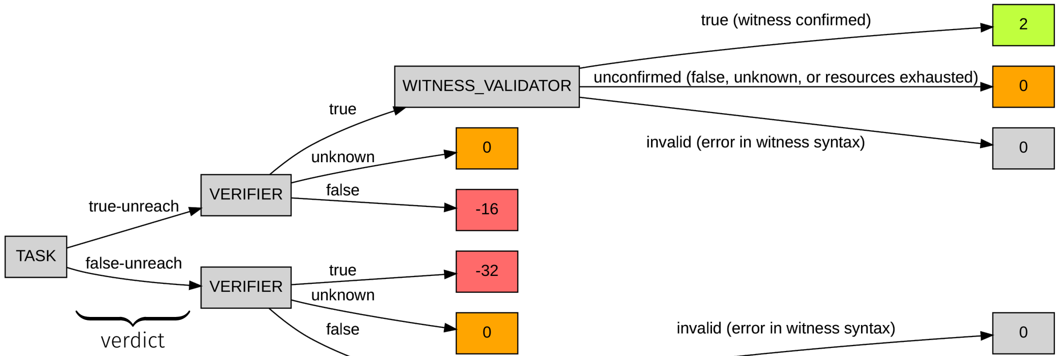
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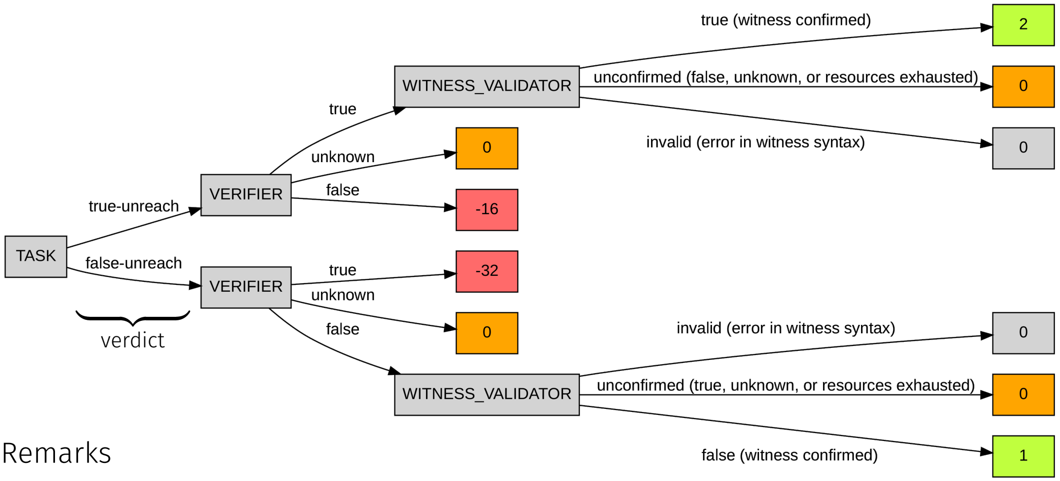
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Remarks

- community-based curation of verdicts
- 187 manual fixes on my end

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You may have a high raw score but not so good overall score.

SV-Comp's "Witnesses"

Motivation

- Ensure that results can be validated, at a reduced computational cost

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[6] Beyer, Dangl, Dietsch, Heizmann, Lemberger, and Tautschnig. "Verification Witnesses". 2022.

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- 96.4% of Mopsa's trivial witnesses are validated

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Adapting Mopsa to SV-Comp’s Framework

Our approach

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- New analyses restart from scratch

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Mopsa validates 54% of correct tasks (61% for overall winner, UAutomizer).

Mopsa’s Results

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Reachability

Mopsa scores a bit below Goblint.[7]

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Overflow

Ranks 6th/19, before Frama-C and Goblint.

Mopsa is on par with the winner for the number of programs proved correct!

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Bronze medal in the *SoftwareSystems* category!

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Mopsa ranks second on raw scores.

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- Synergy with symbolic execution tools

Mopsa at the Software Verification Competition

Raphaël Monat

SyCoMoRES team

`rmonat.fr`

ProgLang @ Inria
9 February 2023