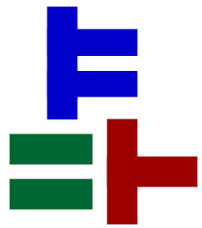
COST action EuroProofNet. WG3 Program Verification

Mădălina Erașcu

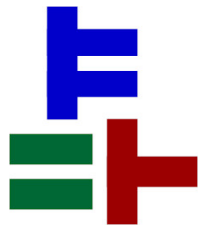
September 18th, 2025



EuroProofNet[1]

Boost the interoperability and usability of proof systems

- Express new proof systems in the Dedukti logical framework
- Promote the output of checkable proofs from automated provers
- Make program verification more effective and accessible
- Gather proofs translated in Dedukti into a database
- Provide tools for searching large libraries of formal proofs
- Develop the use of machine learning techniques in proofs
- Develop a modular theory of type theories
- Develop natural or controlled languages in proof systems

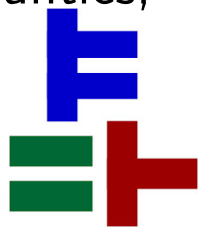


[1] Slide courtesy of Frédéric Blanqui

WG3 - Program Verification

Goal:

- Make program verification more effective and accessible.
- WG3 - beyond the state-of-the-art
  - Verification approaches can envisage new applications and integration of proof systems to overcome challenging problems that combine features that are better expressed in different logics.
  - Scalability and usability of verification techniques can be improved thanks to the exploitation of synergies among different verification tools.
  - Make verification techniques more successful by taking advantage of advances on interoperability between automated and interactive theorem proving, the mathematical formalisation of program semantics, and type theory.

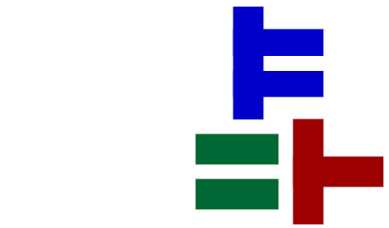


Back in 2023: WG3 Timisoara meeting

- Bring together members of the different communities.
- Create an excellent and inclusive network of researchers in Europe.
- **Discussions** to identify steps towards achieving the action's goals in particular **Deliverables D5 and D6**.
- **Talks** in order to **transfer knowledge** in terms of expertise.

Deliverables:

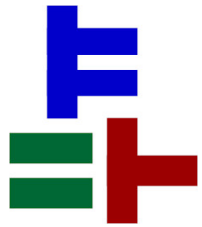
- **D5 (month 18)**: Comparison of the approaches used in the Software Verification competition SV-COMP.
- **D6 (month 24)**: Software prototype for the inference of program specifications as logical axioms.



Output of D5

In the Timisoara meeting, we decided:

- The deliverable will be a wiki page
- Tool inventory will try to follow the following format[2]
  - What inputs are supported?
  - What properties can be verified?
  - What are the tool?s main techniques for the supported (input, property) pairs?
  - What external tools are used? (compilers, SMT solvers, etc.)
  - What is the tool's URL?
  - What is the ?canonical reference? to a system description?
- We will not be restraint to tools from SV-COMP but extend to tools in the Termination Competition and tools analyzing the termination and complexity bounds.



[2] Thanks to Carsten Fuhs

Output of D5 (cont'd)

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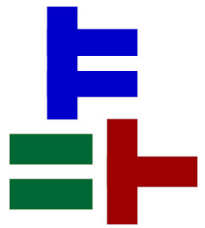

[3] https://sv-comp.sosy-lab.org/

[4] https://termination-portal.org/wiki/Termination_Competition

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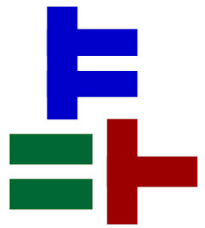

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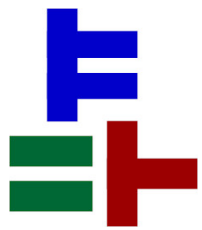
- The competition introduces a shared benchmark suite that enables objective evaluation of different software verification tools.
- It highlights and rewards the work of developers, especially students and researchers, who contribute technical innovations.
- By establishing public benchmarks and showcasing state-of-the-art methods, it supports progress and collaboration in software verification research.



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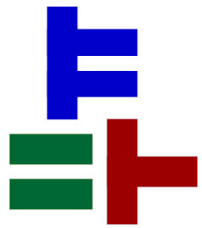

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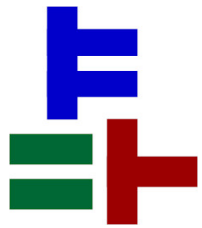

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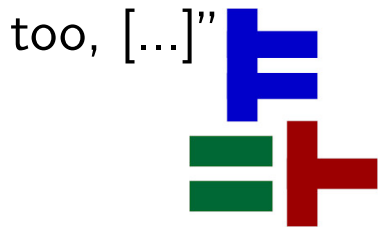
- Ask them to contact directly possible contributors.
- Took one of the papers on the progress of SV-COMP and write individual emails to the authors of the tools found in this paper.
  - Most of them did not answer.
  - "The sv-comp tools are already on Zenodo as well as their individual GitHub sites. Instead of cloning these on your repository too, [...]"



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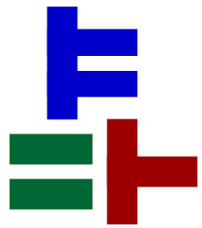

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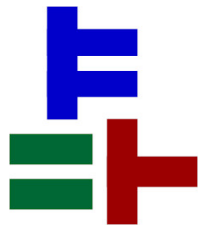

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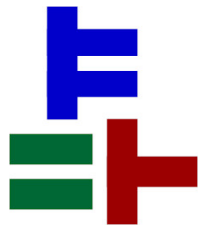

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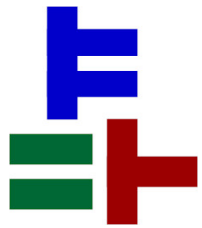

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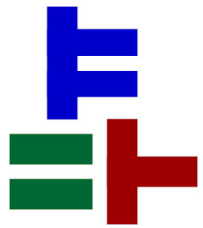
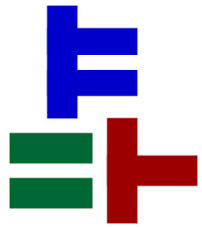
4. Challenge: Discoverability is limited if the wiki lives in isolation. Solution: Cross-link with related initiatives (benchmarks, workshops, mailing lists), and add tags/categories so tools can be filtered and searched more easily.

How did you proceed to achieve greater involvement?



Simmilar initiatives[5]



[5] Thanks to ChatGPT5

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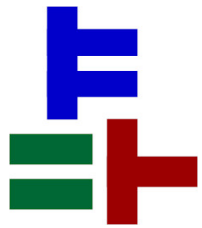

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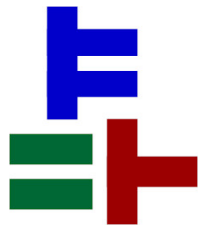

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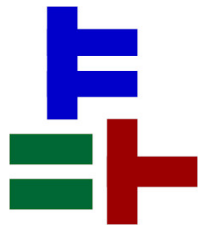

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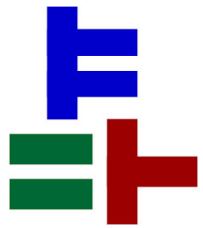

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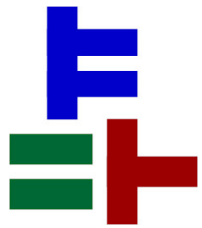
- List of model checking tools (Wikipedia) `https://en.wikipedia.org/wiki/List_of_model_checking_tools`



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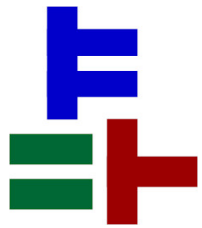
- Open Hardware Verification `https://github.com/ben-marshall/awesome-open-hardware-verification`



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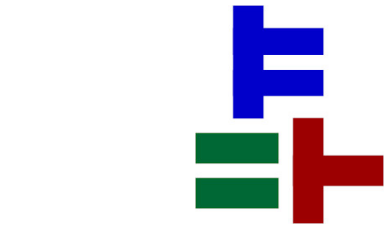
Program Verification Tools - Community Input Survey



Questions?