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**EuroProofNet – WG3**

## Comparison of Existing Tools/Benchmarks

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# Tools

**- What features to focus upon?**

- Automation vs interaction
- Data structures
- Programming model
- Inter/intra-procedural analysis
- Invariant inference
- Termination analysis
- ...

# Tools

- Dafny
- Why3
- SeaHorn
- Vajra (and Diffy)
- Rapid
- Automation
- Data structures – arrays, int, data types
- Programming model - single loops
- Inter-procedural analysis
- Invariant inference
- Termination analysis
- ...

# Tools on SVComp

- SeaHorn <sup>(3)</sup>
- Vajra (and Diffy) <sup>(4)</sup>
- Rapid <sup>(1), (2)</sup>

Experiments as of January 2022,

[https://github.com/vprover/vampire\\_publications/blob/master/paper\\_drafts/rapid\\_induction.pdf](https://github.com/vprover/vampire_publications/blob/master/paper_drafts/rapid_induction.pdf)

Benchmark	(1)	(2)	(3)	(4)	Benchmark	(1)	(2)	(3)	(4)
atleast_one_iteration_0	✓	✓	✓	✓	init_prev_plus_one_0	✓	✓	-	-
atleast_one_iteration_1	✓	✓	✓	✓	init_prev_plus_one_1	✓	✓	-	-
count_down	✓	-	-	-	init_prev_plus_one_alt_0	✓	✓	-	-
eq	✓	-	✓	-	init_prev_plus_one_alt_1	✓	✓	-	-
find_sentinel	✓	✓	-	-	insertion_sort	-	-	-	-
find1_0	✓	✓	-	-	max_prop_0	✓	✓	-	✓
find1_1	✓	✓	✓	-	max_prop_1	✓	✓	-	✓
find2_0	✓	✓	✓	-	merge_interleave_0	✓	-	-	✓
find2_1	✓	✓	✓	-	merge_interleave_1	✓	-	-	✓
indexn_is_arraylength_0	✓	✓	✓	-	min_prop_0	✓	✓	-	✓
indexn_is_arraylength_1	✓	✓	✓	-	min_prop_1	✓	✓	-	✓
set_to_one	✓	✓	✓	✓	partition_0	✓	✓	-	✓
str_cpy_3	✓	✓	✓	-	partition_1	✓	✓	-	✓
add_and_subtract	✓	-	-	✓	push_back	✓	✓	-	✓
both_or_none	✓	✓	-	✓	reverse	✓	✓	-	-
check_equal_set_flag_1	✓	✓	-	✓	rewnifrev	✓	-	-	✓
collect_indices_eq_val_0	✓	✓	-	✓	rewrev	✓	-	-	✓
collect_indices_eq_val_1	✓	✓	-	-	skipped	✓	-	-	✓
copy	✓	✓	-	✓	str_cpy_0	✓	✓	-	-
copy_absolute_0	✓	✓	-	✓	str_cpy_1	✓	✓	-	-
copy_absolute_1	✓	✓	-	✓	str_cpy_2	✓	✓	-	-
copy_and_add	✓	-	-	✓	swap_0	-	✓	✓	✓
copy_nonzero_0	✓	✓	-	✓	swap_1	-	✓	✓	-
copy_partial	✓	✓	-	✓	vector_addition	✓	✓	-	✓
copy_positive_0	✓	✓	-	✓	vector_subtraction	✓	✓	-	✓
copy_two_indices	✓	✓	-	-	check_equal_set_flag_0	✓	-	-	-
find_max_0	✓	✓	-	✓	find_max_1	✓	-	-	-
find_max_2	✓	✓	-	✓	find_max_from_second_1	✓	-	-	-
find_max_from_second_0	✓	-	-	✓	find1_2	✓	✓	-	-
find_max_local_2	-	-	-	-	find1_3	✓	✓	-	-
find_max_up_to_0	-	-	-	-	find2_2	✓	✓	-	-
find_max_up_to_2	-	-	-	-	find2_3	✓	✓	-	-
find_min_0	✓	✓	-	✓	collect_indices_eq_val_2	✓	✓	-	-
find_min_2	✓	✓	-	-	collect_indices_eq_val_3	✓	-	-	-
find_min_local_2	-	-	-	-	copy_nonzero_1	✓	✓	-	-
find_min_up_to_0	-	-	-	-	copy_positive_1	✓	✓	-	-
find_min_up_to_2	-	-	-	-	find_max_local_0	-	-	-	-
find1_4	-	✓	-	-	find_max_local_1	✓	-	-	-
find2_4	✓	✓	-	-	find_max_up_to_1	-	-	-	-
in_place_max	✓	✓	-	✓	find_min_1	-	-	-	-
inc_by_one_0	✓	✓	-	✓	find_min_local_0	-	-	-	-
inc_by_one_1	✓	✓	-	✓	find_min_local_1	✓	-	-	-
inc_by_one_harder_0	✓	✓	-	✓	find_min_up_to_1	-	-	-	-
inc_by_one_harder_1	✓	✓	-	✓	merge_interleave_2	✓	-	-	-
init	✓	✓	-	-	partition_2	✓	✓	-	-
init_conditionally_0	✓	✓	-	-	partition_3	✓	✓	-	-
init_conditionally_1	✓	✓	-	✓	partition_4	-	-	-	-
init_non_constant_0	✓	✓	-	-	partition_5	-	✓	-	-
init_non_constant_1	✓	✓	-	✓	partition_6	-	-	-	-
init_non_constant_2	✓	✓	-	✓	partition-harder_0	✓	✓	-	-
init_non_constant_3	✓	✓	-	✓	partition-harder_1	✓	✓	-	-
init_non_constant_easy_0	✓	✓	-	-	partition-harder_2	✓	-	-	-
init_non_constant_easy_1	✓	✓	-	✓	partition-harder_3	✓	-	-	-
init_non_constant_easy_2	✓	✓	-	✓	partition-harder_4	✓	-	-	-
init_non_constant_easy_3	✓	✓	-	✓	str_len	✓	✓	-	-
init_partial	✓	✓	-	✓					
					Total solved	93	78	13	47

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# Other Benchmarks

- SMT-Lib (WG2)
- TPTP (WG2)

# Other Benchmarks & Tools/Provers

Benchmark	VAMPIRE				CVC4				Z3			
	A+T	A+I	F+T	F+I	A+T	A+I	F+T	F+I	A+T	A+I	F+T	F+I
absolute-prop1	✓	✓	✓	✓	t	t	t	t	t	t	t	t
absolute-prop2	✓	✓	t	✓	t	t	t	t	t	t	t	t
atleast-one-iteration	✓	t	✓	t	t	t	t	t	✓	✓	✓	✓
both-or-none	✓	✓	✓	✓	t	t	t	t	t	t	t	t
check-equal-set-flag	t	t	t	t	t	t	t	t	t	t	t	t
copy	✓	✓	✓	✓	t	t	t	t	t	t	t	t
copy-nonzero-prop1	t	t	t	t	t	t	t	t	t	t	t	t
copy-nonzero-prop2	t	t	t	t	t	t	t	t	t	t	t	t
copy-odd	✓	✓	✓	✓	t	t	t	t	t	t	t	t
copy-partial	✓	✓	✓	✓	t	t	t	t	t	t	t	t
copy-positive	t	t	t	t	t	t	t	t	t	t	t	t
copy-two-indices	t	✓	t	✓	t	t	t	t	t	t	t	t
find1-prop1	✓	t	✓	t	t	t	t	t	✓	✓	✓	✓
find1-prop2	✓	t	✓	t	t	t	t	t	t	t	t	t
find1-prop3	✓	✓	✓	✓	t	t	t	t	t	t	t	t
find2-prop1	✓	✓	✓	✓	✓	t	✓	t	✓	✓	✓	✓
find2-prop2	✓	✓	✓	✓	t	t	t	t	t	✓	t	t
find2-prop3	✓	✓	✓	✓	t	t	t	t	t	✓	t	t
find-max	t	t	t	t	t	t	t	t	t	t	t	t
find-max-up-to-prop1	t	t	t	t	t	t	t	t	t	t	t	t
find-max-up-to-prop2	✓	✓	✓	✓	t	t	t	t	t	t	t	t
find-max-from-second	t	t	t	t	t	t	t	t	t	t	t	t
find-min	t	t	t	t	t	t	t	t	t	t	t	t
find-min-up-to	✓	✓	✓	✓	t	t	t	t	t	t	t	t
find-sentinel	✓	✓	✓	✓	t	t	t	t	t	✓	t	t
find-two-max-prop1	t	t	t	t	t	t	t	t	t	t	t	t
find-two-max-prop2	t	t	t	t	t	t	t	t	t	t	t	✓
in-place-max	t	t	t	t	t	t	t	t	t	t	t	t
increment-by-one-prop1	✓	✓	✓	✓	t	t	t	t	t	t	t	t
increment-by-one-prop2	✓	✓	t	✓	t	t	t	t	t	t	t	t
indexn-is-arraylength	✓	✓	✓	✓	t	t	t	t	✓	✓	✓	✓
init	✓	✓	✓	✓	t	t	t	t	t	t	t	t
init-conditionally-prop1	t	t	t	t	t	t	t	t	t	t	t	t
init-conditionally-prop2	t	t	t	t	t	t	t	t	t	t	t	t
init-even	t	✓	t	✓	t	t	t	t	t	✓	t	t
init-non-constant	✓	✓	✓	✓	t	t	t	t	t	t	t	t
init-partial	✓	✓	✓	✓	t	t	t	t	t	✓	t	t
init-previous-plus-one	t	t	t	t	t	t	t	t	t	t	t	✓
max-prop1	✓	✓	✓	✓	t	t	t	t	t	t	t	t
max-prop2	✓	✓	✓	✓	t	t	t	t	t	t	t	t
merge-interleave-prop1	t	✓	t	✓	t	t	t	t	t	t	t	t
merge-interleave-prop2	t	t	t	t	t	t	t	t	t	t	t	t
palindrome	t	t	t	t	t	t	t	t	t	t	t	t
partition	t	t	t	t	t	t	t	t	t	t	t	t
partition-init	t	t	t	t	t	t	t	t	t	t	t	t
push-back-prop1	t	✓	t	✓	t	t	t	t	t	✓	t	✓
push-back-prop2	t	✓	t	✓	t	t	t	t	t	t	t	t
reverse	✓	✓	✓	✓	t	t	t	t	t	t	t	t
set-to-one	✓	t	✓	t	t	t	t	t	✓	✓	✓	✓
str-cpy	✓	✓	✓	✓	t	t	t	t	t	t	t	t
str-len	✓	✓	✓	✓	t	t	t	t	t	t	t	t
swap-prop1	t	t	t	t	t	t	t	t	t	t	t	t
swap-prop2	t	t	t	t	t	t	t	t	t	t	t	t
vector-addition	✓	✓	✓	✓	t	t	t	t	t	t	t	t
vector-subtraction	✓	✓	✓	✓	t	t	t	t	t	t	t	t
Total	35				1				13			
Unique	24				0				2			

Experiments as of November 2018  
<https://easychair.org/publications/open/W2Db>