The 8th Reactive Synthesis Competition: SYNTCOMP'21

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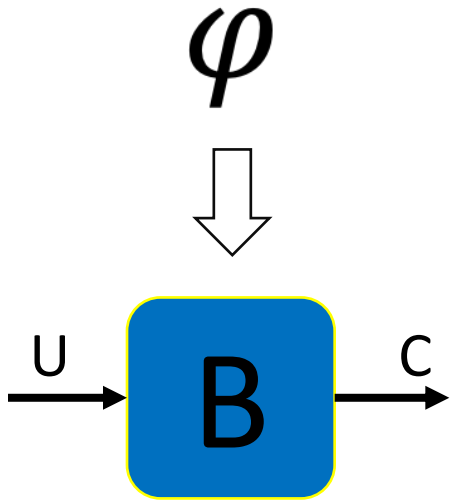
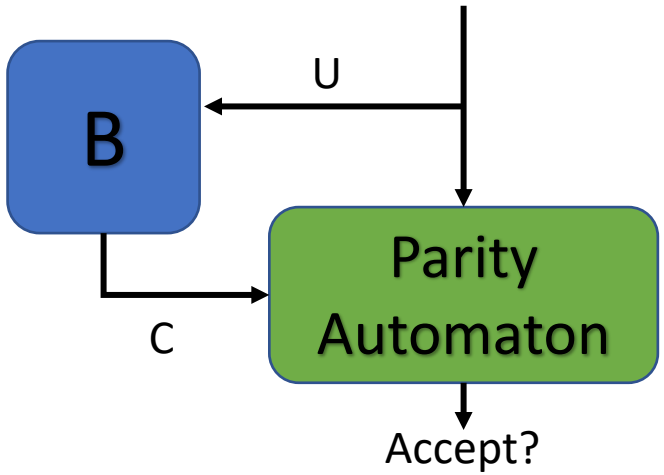
What is Reactive Synthesis?

- Synthesize a circuit B for a given circuit A such that error is not raised for any sequence of Us
- Synthesize a circuit B that satisfies an LTL formula φ on its inputs and outputs, for any sequence of U's
- Synthesize a circuit B for a given automaton A such that it accepts for any sequence of U's

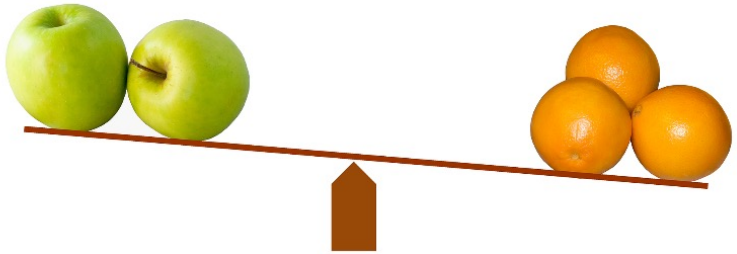




Why do we need SYNTCOMP?

Make it easier to compare synthesis tools

- Establish a benchmark format
- Collect a benchmark library
- Fair and comprehensive evaluation



Guide development of synthesis tools

- Encourage implementation of mature push-button tools
- Improve state of the art through challenging benchmarks

Historical milestones and rules

- 2014 – 1st SYNTCOMP @ Vienna Summer of Logic
- 2016 – 3rd SYNTCOMP: LTL/TLSF tracks added
- 2019 – 6th SYNTCOMP: migration to StarExec
- 2020 – 7th SYNTCOMP: new parity-automata track

Input: specification in AIGER, TLSF, or HOA

Output: Y/N answer or implementation in AIGER

Ranking: based on quantity and quality (size) of solutions

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Participants and rankings

Participants

LTL:

- ltlsynt (Duret-Lutz, Colange, Michaud, Pommellet, Renkin, Schlehuber-Caissier @ EPITA)
- Strix (Meyer, Sickert, Luttenberger @ TUM)
- Spore (Delfosse, Tamines, Staquet, Bruyere @ UMons)
- Otus (Abraham, Sickert, van Dijk@ UTwente, TUM)
- sdf (Khalimov @ ULB)
- Acacia-bonsai (Cadilhac, Perez @ DePaul, UAntwerp)

Parity automata:

- Strix (Meyer, Sickert, Luttenberger @ TUM)
- Knor (van Dijk)

Results: Parity automata

Synthesis: 303 benchs, 0.5/1hr Wall-clock/CPU time

1. Knor-synt-sym (276 solved)
2. Strix-sequential (260 solved)
*. Strix-parallel-2020 (259 solved)

Quality ranking

1. Strix-sequential (374.89 pts)
*. Strix-parallel-2020 (374.36 pts)
2. Knor-synt-sym (252.66 pts)

Combinatorially-hard realizability: 217 benchs

1. Knor-tl (216 solved)
*. Strix-parallel-2020 (150 solved)
2. Strix-sequential (136 solved)
3. Knor-fpj (120 solved)
4. Knor-fpi (101 solved)

Results: LTL (sequential) realizability

924 benchs, 2.8/1hr Wall-clock/CPU time

1. Strix

Strix-ltl_real_zlk_pq solved 827 benchmarks

Strix-ltl_real_zlk_pq solved 1 benchmark no-one else did: 'LTL-Real/round_robin_arbiter_unreal14_7.tlsf'

Strix-ltl_real_zlk_bfs solved 805 benchmarks

Strix-ltl_real_acd_bfs solved 801 benchmarks

2. ltlsynt

ltlsynt21_real-seqreallar solved 745 benchmarks- ltlsynt21_real-seqreallar2 solved 745 benchmarks

ltlsynt21_real-seqrealds solved 712 benchmarks

3. Otus: Otus-otus-ltl-realizability-sequential-jbdd solved 532 benchmarks

4. Spore

SPORE-ltl-real-recpar-single-bdd-seq solved 499 benchmarks

SPORE-ltl-real-recpar-bdd-seq solved 498 benchmarks

SPORE-ltl-real-recpar-reg-seq solved 432 benchmarks

Results: LTL (parallel) realizability

1. sdf

- sdf-real solved 730/942 benchmarks
- sdf-real solved 6 benchmarks no-one else did
- sdf-real_p solved 678 benchmarks

2. Otus

- Otus-otus-ltl-realizability-parallel-sylvan solved 542 benchmarks

Results: LTL synthesis

924 benchs, 2.8/1hr Wall-clock/CPU time

1. Strix

Strix-ltl_synth_acd_bfs with a score of 793.18 pts

Strix-ltl_synth_zlk_bfs, 789.47 pts

Strix-ltl_synth_zlk_pq, 782.47 pts

2. ltlsynt

ltlsynt-seqsyntlarabc2 543.00 pts

ltlsynt-seqsyntdsabc 521.08 pts

ltlsynt-seqsyntlarabc 506.49 pts

3. Otus

otus-ltl-synthesis-sequential-jbdd 249.44 pts

For the parallel track:

1. sdf

sdf-synt 447.54 pts

sdf-synt_p 406.58 pts

2. Otus

otus-ltl-synthesis-parallel-sylvan 248.40 pts

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Discussion and conclusion

Discussion points

1. LTL/TLSF benchmark families: **parameterized (GitHub)**
2. Benchmark license: **cc-by**
3. Parallel vs. sequential: **general** vs. sequential
4. Quality ranking: gates **and latches** counted
5. Continue with StarExec? **Alternatives: Airflow, Snakemake**
6. Anything else…

Conclusion

SYNTCOMP'21 Winners

Track	Tool
Parity (synth)	Knor
Parity (synth quality)	Strix
Hard parity (real)	Knor
LTL (real)	Strix
LTL (parallel real)	Sdf
LTL (synth)	Strix
LTL (parallel synth)	Sdf

Thank you, to all participants!
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