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# What is this talk about?

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FuzzChick is an experiment to improve QuickChick using ideas from fuzzing, such as AFL.

We'll come back to this...

# QuickChick: A Brief Review

QuickChick is a properties based testing framework for Coq.

- You build (or derive) generators for data types.
- Using those generators you can feed data into test cases.
- These test cases can be any arbitrary predicate.

# QuickChick: Pros and Cons

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What's not so great about QuickChick?

- Getting *good* generators can be hard!

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In general you want good coverage. How can you achieve that with minimal work?

# Finally, FuzzChick!

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Why is this good?

# FuzzChick Intuition

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Maybe we can utilize AFL's smarts to achieve better test coverage.



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Chobbes opened this issue 2 days ago · 7 comments

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Maintainer fixed this issue promptly, which was *awesome*!

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  - ▶ Modified QuickChick to include test case in name, but still not ideal.

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










But...

# It works! We can measure stuff!

# QuickChick Coverage: ifc-basic

Coverage with QuickChick in the ifc-basic example:

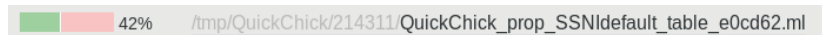
## Coverage report 44.33%

		42%	<a href="#">/tmp/QuickChick/214311/QuickChick_prop_SSNldefault_table_e0cd62.ml</a>
		46%	<a href="#">/tmp/QuickChick/214315/QuickChick_prop_SSNl_deriveddefault_table_65753a.ml</a>
		43%	<a href="#">/tmp/QuickChick/214320/QuickChick_prop_MSNIdefault_table_31e78d.ml</a>
		43%	<a href="#">/tmp/QuickChick/214324/QuickChick_myArgs_71227b.ml</a>
		44%	<a href="#">/tmp/QuickChick/214327/QuickChick_myArgs_81c382.ml</a>
		49%	<a href="#">/tmp/QuickChick/214330/QuickChick_myArgs_100552.ml</a>

Generated on 2018-11-28 21:43:33 by *Bisect\_ppx* 1.3.4

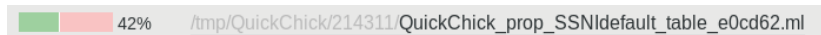
# QuickChick vs FuzzChick: ifc-basic

QuickChick:

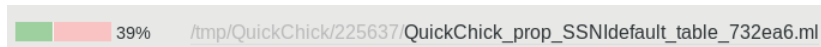


# QuickChick vs FuzzChick: ifc-basic

QuickChick:



FuzzChick:



For some reason it seems that FuzzChick actually gets worse coverage than QuickChick on this test case... At least in the time I let it run (I'm not terribly patient)

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- Something's not instrumented correctly?
- This test case, for whatever reason, is fuzzer unfriendly?
  - ▶ Maybe extracted Coq could be fuzzer unfriendly? Lots of inefficient data types like `nat` (basically a linked list whose length represents a number).
  - ▶ Could result in excessively long paths and hard to solve predicates for DSE?



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- ▶ Didn't really work out because it takes a long time to find bugs by fuzzing.
- ▶ Decided it wasn't really a great comparison to FuzzChick which is a properties based testing tool anyway.
- ▶ Some useful scripts / documentation to get this running in our git repo. [1]

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## ■ Plain AFL!

- ▶ Similar story to Honggfuzz.

Conclusion! Questions?

Whew! Questions?

# References

-  Calvin Beck, Jiani Huang, and Yishuai Li. *Quick700*. 2018. URL: <https://github.com/Quick700/Quick700> (visited on 11/29/2018).
-  Leonidas Lampropoulos, Zoe Paraskevopoulou, and Benjamin C Pierce. “Generating Good Generators for Inductive Relations”. In: ().

These are all good resources! You should look at them!