

Show me your properties!

The potential of property-based testing in Agent-Based Simulation

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The Gintis Case

Testing in ABS?

- not existent, 1 paper focusing on it completely, very neglected but important.
- Gintis case: might have been possible to not

property-based testing might be of help

- Express specifications directly in code.
- QuickCheck library generates random test-cases.
- Developer can express expected coverage.
- Random Property-Based Testing + Stochastic ABS = ♥♥♥

QuickCheck

List Properties

```
-- the reverse of a reversed list is the original list
reverse_reverse :: [Int] -> Bool
reverse_reverse xs
  = reverse (reverse xs) == xs

-- concatenation operator (++) is associative
append_associative :: [Int] -> [Int] -> [Int] -> Bool
append_associative xs ys zs
  = (xs ++ ys) ++ zs == xs ++ (ys ++ zs)

-- reverse is distributive over concatenation (++)
reverse_distributive :: [Int] -> [Int] -> Bool
reverse_distributive xs ys
  = reverse (xs ++ ys) == reverse xs ++ reverse ys
```

QuickCheck cont'd

Running the tests...

```
+++ OK, passed 100 tests.  
+++ OK, passed 100 tests.  
*** Failed! Falsifiable (after 3 tests and 1 shrink):  
[1]  
[0]
```

QuickCheck cont'd

Labeling

```
reverse_reverse_label :: [Int] -> Property
reverse_reverse_label xs
  = label ("length of list is " ++ show (length xs))
    (reverse (reverse xs) == xs)
```

Running the tests...

```
+++ OK, passed 100 tests:
5% length of list is 27
5% length of list is 15
5% length of list is 0
4% length of list is 4
4% length of list is 19
...
```

QuickCheck cont'd

Coverage

```
reverse_reverse_cover :: [Int] -> Property
reverse_reverse_cover xs = checkCoverage
  cover 15 (length xs >= 50) "length of list at least 50"
  (reverse (reverse xs) == xs)
```

Running the tests...

```
+++ OK, passed 12800 tests
    (15.445% length of list at least 50).
```


Encoding Agent Specifications

Testing Invariants

Model Validation

Hypothesis Testing

Conclusion

ABS as discipline needs to embrace code-testing either through unit- or propert-based tests

Thank You!