ARTICLE TEMPLATE

Specification Testing of Agent-Based Simulation using Property-Based Testing.

Jonathan Thaler [a] and Peer-Olaf Siebers[a]

[a]School Of Computer Science, University of Nottingham, 7301 Wollaton Rd, Nottingham, UK;

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ABSTRACT
This paper shows how to apply random property-based testing on a technical level to encode and test specifications of agent-based simulations. It is shown that as opposed to unit testing, random property-based testing is a natural match to test stochastic agent-based simulation and is able to encode full agent and model specifications including probabilities. The outcome are specifications expressed directly in code, which relate whole classes of random input to expected classes of output. During test execution, random test data is generated automatically, potentially covering the equivalent of thousands of unit tests. The expressiveness and power of property-based testing is not limited to be part of a test driven development process where they act as specifications, verification and regression tests but can be integrated as a fundamental part of the model development process, supporting the hypothesis and discovery process, where the process of specifying the model is actually already the implementation process. This should result in high confidence that the model at hand is very likely to be correct, something of fundamental importance in ABS.

KEYWORDS
Testing; Test Driven Development;

1. Introduction

aim of the paper is to build on the rather conceptual paper by me at summersim19 and show property-based testing in ABS on a much more technical level by the case studies of: - encoding agent-specifications of time- and event-driven ABS SIR into property-based tests - random event sampling - compare two different implementations - and encode model invariants

hypothesise that a strong reason for why testing in ABS is not very widely used and adopted is that unit testing is not able to deal very well with the stochastic nature of ABS in general. random property-based testing is a remedy to that problem as it allows to relate whole classes of inputs to specific classes of output for which then randomised test cases are automatically generated, covering potentially thousands of unit tests.

TODO: it would be great if i can show how property-based testing found a bug in an implementation

CONTACT Jonathan Thaler. Email: jonathan.thaler@nottingham.ac.uk