

Perspectives on Agent Based Social Simulation

Validation, Verification and the FIRMA Project



Foundational and representational ABSS

- Foundational ABSS develops tools, approaches and representations for representational ABSS
- Representational ABSS describes what we observe



Foundational ABSS: Degrees of Abstraction

- Highly formal: BDI logics used to investigate the meaning of core issues
 - trust, helpfulness, etc.
- Formal but less abstract: deontic logics used to analyse social rules, legal systems
 - Obligation, duty, right, etc.
- Foundational but concrete: Sugarscape
 - General descriptions of classes of observations



Representational ABSS

- Describing target social systems
- Complements qualitative descriptions
- Less expressive than (say) ethnographic studies
- Relationships expressed with less ambiguity



Validation and Verification

- Validation: determine whether a simulation model is a “good” representation of the target social system
- Verification: determine whether the model is consistent and sound with respect to some formalism or other model or theory



Validation

- Relating models to target systems
 - Requires criteria of goodness of model
- Relevant to representational social simulation
 - What is a “good” representation of a social system?



Form of validation

- Prediction?
- Description?



Prediction as validation

- Social structures exist to support decision making when prediction is not feasible
- Examples:
 - Rules of the stock exchange
 - Rules of commodity markets
 - Conventional competitive practices
 - Informal procedures and relations in organisations
 - Stable friendships and commercial relations



Except for highly constrained cases
(e.g., which side of the road to drive
on) prediction is not a viable option
or goal for the social sciences



Prediction: an IAM view

van Asselt-Rotmans

“The future is inherently uncertain and thus unpredictable.... The issues presently associated with global change distinguish themselves from familiar scientific problems in several respects: ... the phenomena, being novel, complex and variable, are themselves not well understood.”



Description as validation

- Validation is the demonstration that a model is a “good” representation of its target system
- Good means telling the truth and nothing but the truth (though not the whole truth)
- A good model has a subset of the structure and some though not all of the relationships of its target system



Description and Imperative Modelling

- Imperative modelling specifies processes
 - Process inferred from outcomes
 - Process is hard to observe directly
 - Would amount to direct observation of each step by each component
 - Inherently and extremely fine grain activity



Description and Declarative Modelling

- Declarative modelling specifies behaviour
 - In conditions X , John does Y
- Conditions X need not be exhaustive – sufficiency rather than necessity
- Easier to observe whether John systematically does Y in some observable conditions X than to observe everything everyone does during some social process



Relationship of validation to declarative/imperative distinction

	Imperative	Declarative
Foundational	Game theory Sugarscape Arthur's el Farol Models	BDI approaches Edmonds' el Farol models
Representational	vanAsselt-Rotmans Weissbuch/Images Doran's EOS models (?)	Deontic logic applications Moss' Critical incidents, transitional economy models

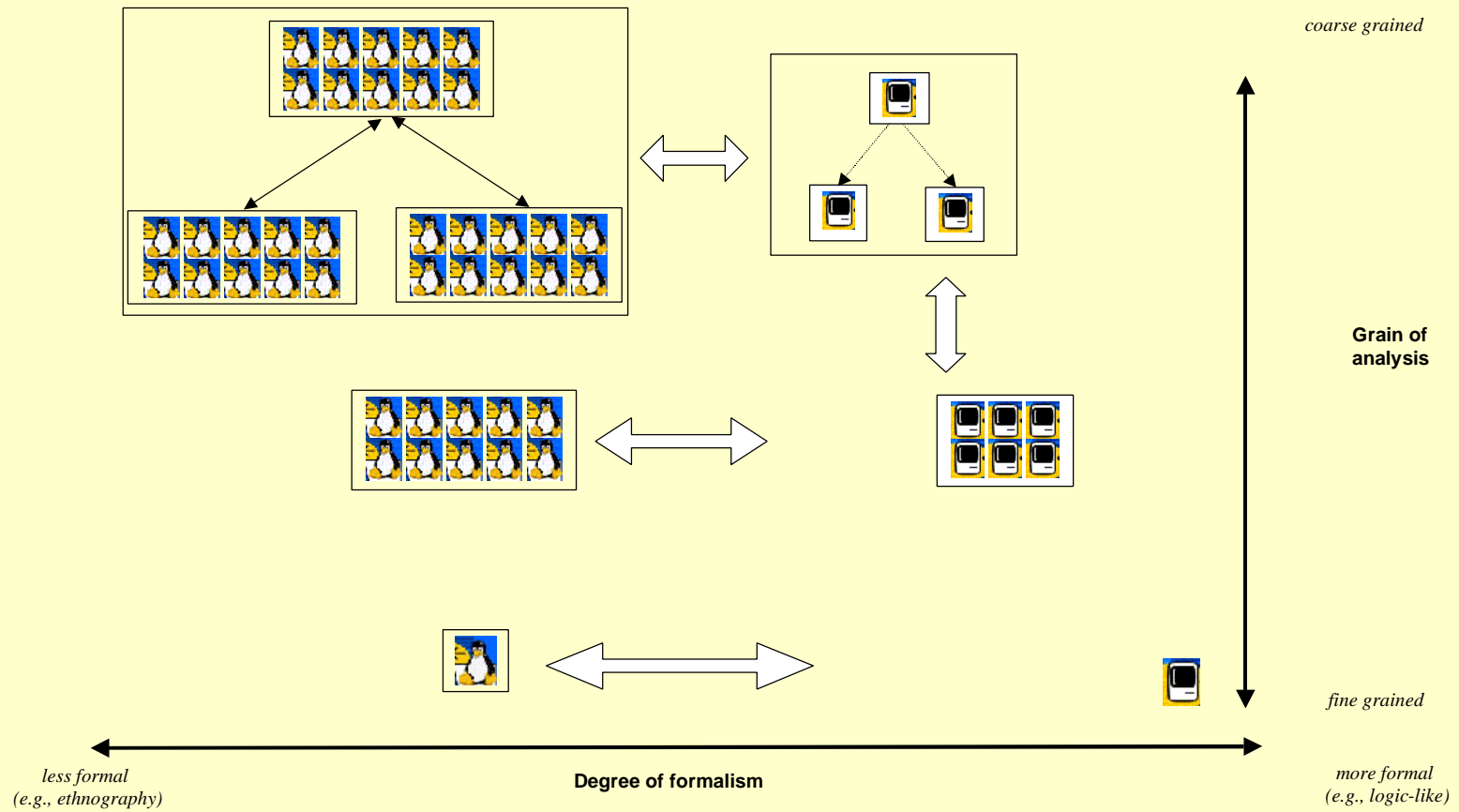


Verification

- Representational verification
 - models at coarser grains of representation entail agents whose behaviour emerges at finer grain
- Foundational verification
 - Agent behaviour sound and consistent wrt a chosen formalism (eg BDI or deontic logic)
 - Agent behaviour conforms to experimentally validated theory of cognition



Validation and Verification



Top-down and Bottom-up

- The top is defined by the largest target system
 - global, regional, national, catchment...
- Bottom less naturally defined
 - ...organisation, department, individual, neurones...
- System development will develop different levels interactively
- But where is the bottom?



Validation determines the bottom

- Declarative agent-based modelling describes agents' actions in various conditions of the system
- The bottom of the system seems likely to be determined by the fineness of grain at which stakeholders or modelling teams can validate the agents as descriptions of target entities (actors, departments, organisations...)
- Independent validation by stakeholders of simulated behaviour at more aggregated levels

