Implementing the institutional stance
toward an agent-based modelling framework for legal, socio-economic scenarios

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Law changes, people change
Economic dynamics, historical changes, new social trends. And still, the complexity of translating into regulations a given policy. The social relevance of evaluating an existing or a future regulative implementation, also considering non-compliance modes..

Let the people do what they do best
Identifying the contextual common patterns between individual cases, people (and among them, experts) can write down typical scenarios [as patterns of social interaction] and the typical [social] roles the agents play in them. Animating these stories means validating the problem and solution spaces given by the experts.

Administrative organizations and policy makers need new tools
A mixed reality agent simulation framework, integrating cognitive models ranging from individual practical interpretations of behaviour to simplified/shared/monolithic conceptualizations..

The base of modelling
In empirical sciences, brute facts. In law? Real facts are processed somehow to count as legal facts, while legal reality intervenes somehow with normative intention on reality. Both somethows are key concepts.

Institutions as internal agents
From the agent’s point of view, to be complying to an institution means to: • be aware of the present institutional state (rules and facts) • reason and create the associated normative rules • behave accordingly. This institutional thinking naturally leads to implement institutions as agents with direct and unique communication with the agent they superevene on.

Institutional thinking
Constitutive and institutional rules can be expressed in the form of normative conditionals: if CONDITIONS then

CONCLUSION

Every new institutional fact draws a new configuration of the jural relations between entities defined in that institution. This new configuration is a result of a forward-chaining reasoning issued with an appropriate logic. However, it is interesting to consider also the other way around, the backward-chaining (conclusion, if condition).

Practical normative indications
Agents can be complying just because the norms exist, or because they can evaluate some positive outcome from them (in a sort of game-theory perspective). Both decision attitudes (deontic or consequentialistic) are strictly related to the decision-making cycle of the agent. Different attitudes could be associated to different components.

Conflicting plans
The modeler has to handle norm vs desire conflicts, altogether with desire vs desire conflicts (caused for example by conflicts between roles), norm vs norm (between institutions), rule vs rule conflicts (for an internal institutional conflict).

Scenarios and roles
As a result, in the proposed framework roles, institutions and rules become basic modelling components for the agents.

Implementation in Jason
Jason is a popular multi-agent system development platform based on a variant of the AgentSpeak language and built on Java. It is based on logic programming and the BDI architecture for cognitive autonomous agents.

Three modelling exercises:
a mythological example of non-compliance
- the story of Achilles avoiding the Trojan War,
an institution as formalised by the law
- the sale process as defined in common law,
a story from an administrative organisation
- a tax evasion scheme in real-estate transactions.

Conclusions
Jason has proved to be an elegant and intuitive platform, but serves more as a middle-ware than a modelling platform that embodies an institutional perspective. In order to develop all the potentialities of the proposed conceptualisation, a strong extension is required.

Proposed developments
An ABM-oriented programming platform unifying: • the elegance and easiness of the syntax of Jason (AgentSpeak) • a stronger modularisation and concurrency capability • the perspective to integrate with expert systems or other knowledge technologies.

Preliminary design principles:
• BDI architecture
• datalow programming oriented
• entity/architecture dichotomy
• forward-chaining operator (for inferences)
• backward-chaining operator (for plans)
• private encapsulation (internal agents)
• public inclusion (shared knowledge)
• explicit maintenance goals
• procedural and declarative memory
• synchronous and asynchronous comm.
• sequential and parallel constructs
• memory retrieval / conflict resolution plans
• three valued logic (false, true, unknown)
• belief annotations
• embedded time
• emb. provenance (percept, comm., inference)
• internal conceptualization of identity

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