Implementing the institutional stance

toward an agent-based modelling framework for legal, socio-economic scenarios

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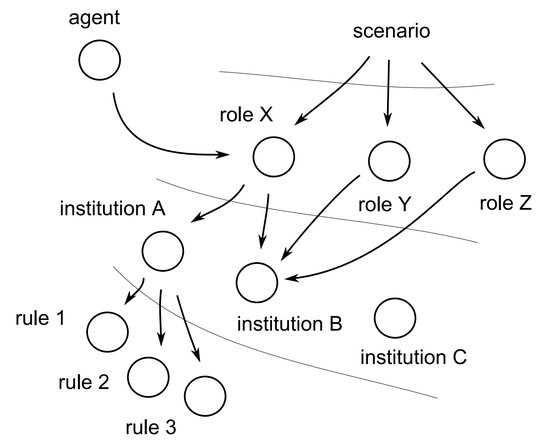


Law changes, people change

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

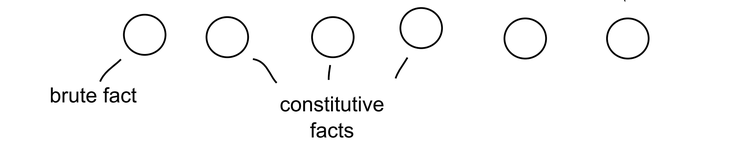
Identifying the contextual common patterns between individual cases, people (and among them, experts) can write down typical scenarios (as patterns of social interaction) and the typical (social) roles the agents play in them. Animating these stories means validating the problem and solution spaces given 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 *somehow*s are key concepts.



The institutional stance

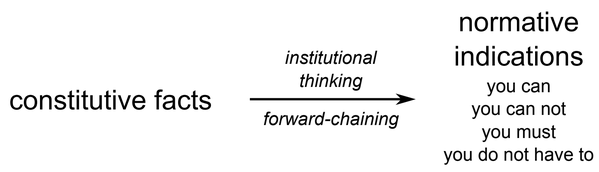
Proceeding along the path traced by Searle, an institution is defined by certain rules and some institutional facts. This conceptualisation unifies games, social informal norms and legal norms.

Institutions as internal agents

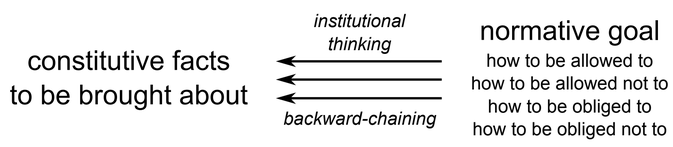
From the agent's point of view, to be complying to an institution means to: • be aware of the present institutional state (rules and facts) • reason and create the associated normative rules • behave accordingly. This institutional thinking naturally leads to implement institutions as agents with direct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

Institutional thinking

Constitutive and institutional rules can be expressed in the form of normative conditionals: *if CONDITIONS then*^{n} *CONCLUSION*.



Every new institutional fact draws a new configuration of the jural relations between entities defined in that institu-tion. 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 *consequen-tialistic*) are strictly related to the decision-making cycle of the agent. Different atti-tudes could be associated to different components.

Conflicting plans

The modeler has to handle *norm vs desire* conflicts, altogheter 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
- dataflow 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

Acknowledgments

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