Towards runtime support for norm change from a monitoring perspective

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Outline

Governance on Electronic institutions

- Apply social abstractions to distributed systems in order to tame their complexity.
  - **Requirement**: Asses, at **run-time** the state of the normative environment (norm violated, norm fulfilled, etc.)

Norms:
- Regulative

$$Win\_Auction(isangi, P) \rightarrow O_{isangi}(Pay\_Product(P) < leave\_auction(isangi))$$
$$In\_progress(P) \rightarrow F_{attendee}(ask\_question < \neg In\_progress(P))$$

- Constitutive

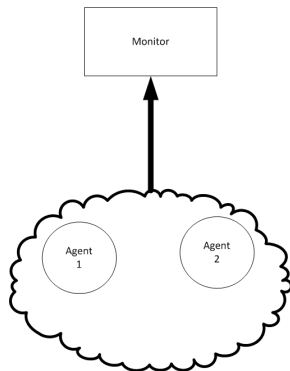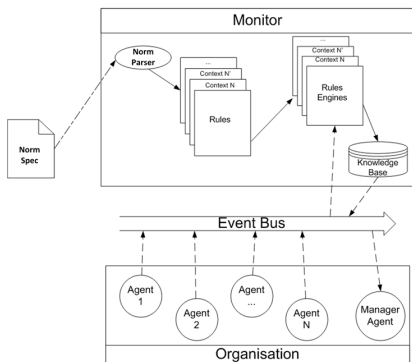$$Raise\_hand \Rightarrow_{Sotherby's} Bid$$
$$Raise\_hand \Rightarrow_{Osaka\_Fish\_Market} Leave$$

- Other (*e.g.*, regimented, conventions)
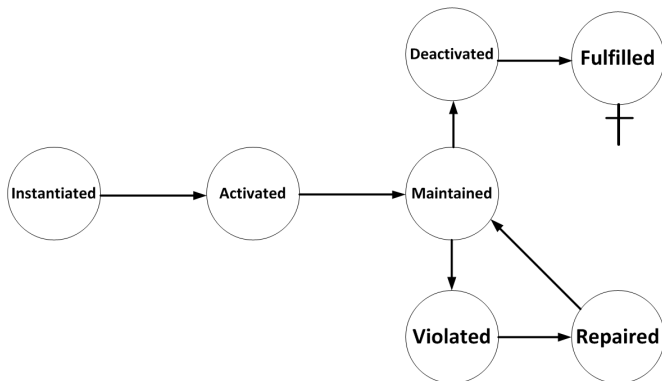
Framework for Governance on EI

Basic Concepts

Basic Concepts:

- Language: $\mathcal{L}_O$
- Ontology: O
- Logic connectives $\{\neg, \vee, \wedge\}$
- Set of all possible well-formed formulas: $wff(\mathcal{L}_O)$ (DNF)
- A *norm n* is a tuple $n = \langle f_A, f_M, f_D, f_w, w \rangle$
- A norm is considered fulfilled if, and only if:
  $f_A \rightarrow [O_w(E_w f_w \leq \neg f_M) \, \mathcal{U} \, f_D]$
- Event: $\langle \alpha, t, p \rangle$
- Normative Monitor: $M_N = \langle N, S, IS, VS, FS, RS, E \rangle$
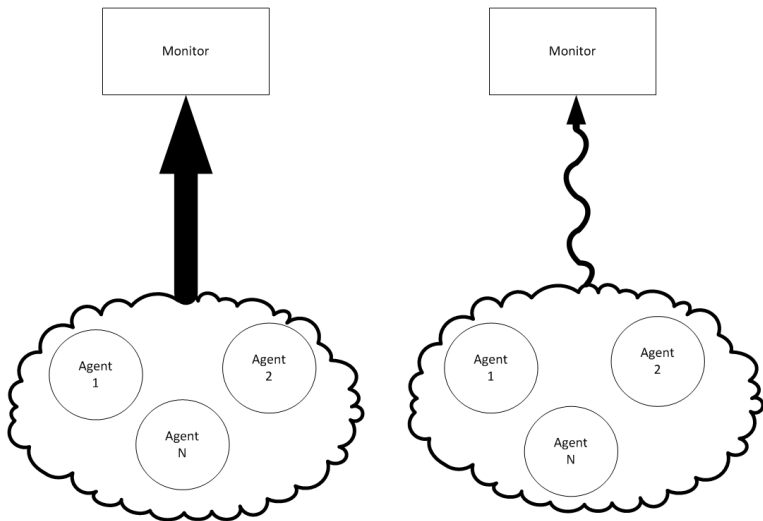
Norm Life-Cycle

$activated(ni) \Leftrightarrow \exists f \in F(s), \Theta(f_A) \equiv f$

$deactivated(ni) \Leftrightarrow \exists \Theta', \exists f \in F(s), \Theta'(f_D) \equiv f \wedge \Theta' \subseteq \Theta$

Scenarios for Governance on EI

Outline

1 **Introduction**

2 **Dynamic Normative Context**

3 **Conclusions and Future Work**

Previous Work

- Jordi Campos et al. *Formalising situatedness and adaptation in electronic institutions*, **2009**
- Tinnemeier et al.*Programming norm change*, **2010**
- G. Aucher et al. *Dynamic context logic and its application to norm change*, **2009**

	Ex Nunc
Context expansion	Prospective Promulgation
Context contraction	Abrogation

- Guido Governatori and Antonino Rotolo *Changing Legal Systems: Abrogation and Annulment*, **2008**

|	*Ex Tunc*	*Ex Nunc*
Context contraction	Annulment	Abrogation

Our Approach

Objective: Real-time expansion and contraction of the normative context in the institution

- Without having to stop monitoring the state of the world
- Inferring new **consistent** information about the state of the world

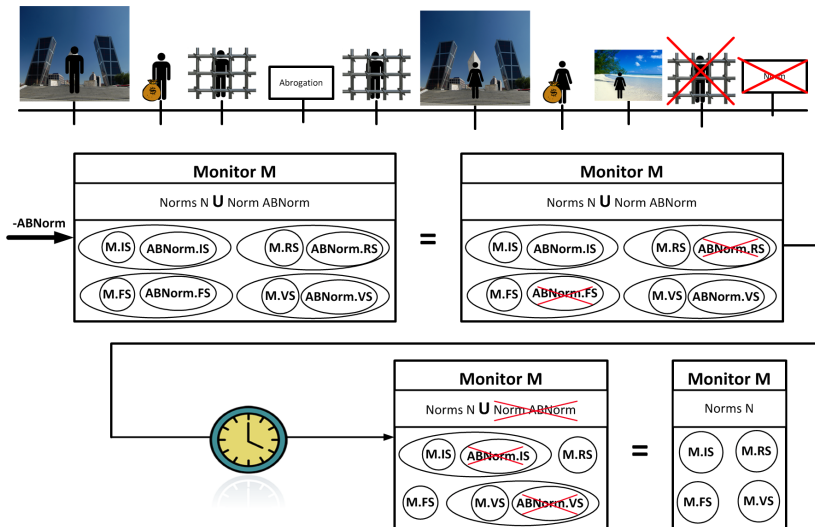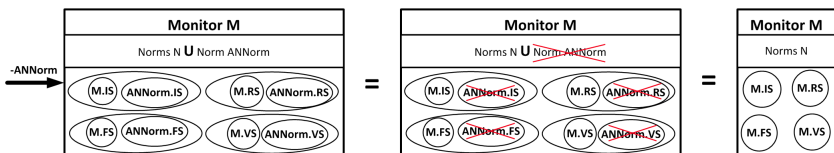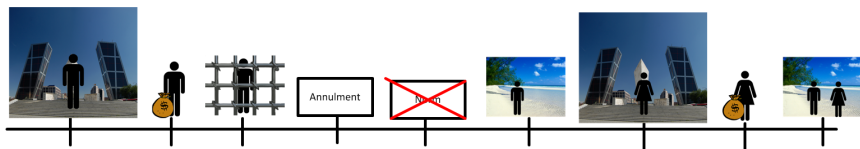|	*Ex Tunc*	*Ex Nunc*
Context expansion	Retroactive Promulgation	Prospective Promulgation
Context contraction	Annulment	Abrogation

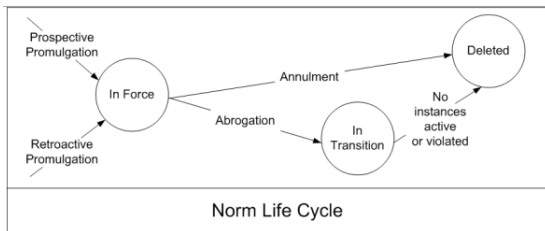# Retroactive Promulgation
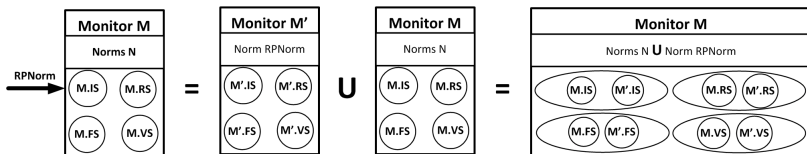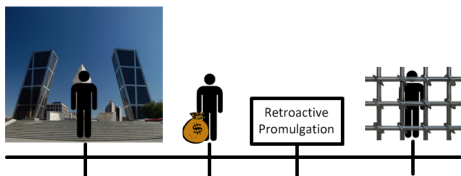
Prospective Promulgation
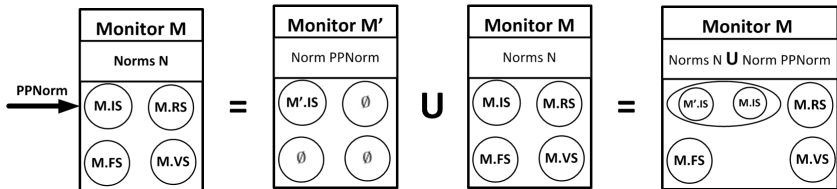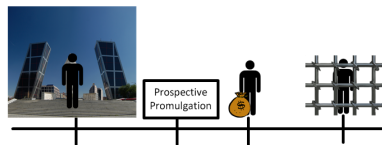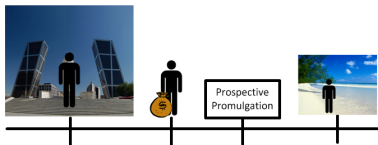
Abrogation

Annulment

Extended Norm Life-Cycle

Enabling new norm states

- In force (contains original norm life-cycle)
- In transition
- Deleted

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Conclusions

- Formal generic method for expanding and contracting institutions at run-time
- Formalisation of the four operations to be supported
- Norm life-cycle extension
- Algorithms

Future Work

The proposed framework has room for improvement:

- Interaction between the proposed framework and previously developed frameworks for:
  - Run-time change of constitutive rules[1]
  - Framework scaling via distributed monitors[2]
- Means to ensure normative-context modifications result in a consistent and non-redundant normative-context
- Statement of framework's efficiency via tests on a prototype
- Development of adaptive normative contexts
  - Support for detecting when norm-change is required from an institutional point of view
  - Provide means for agents to autonomously perform norm change

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[1] H. Aldewereld et al. *Making norms concrete*, **2010**

[2] I. Gómez-Sebastià, et al. *A distributed norm compliance model*, **2010**

Thanks

Thank you for your attention

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