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# Coordination, Organizations, Institutions, and Norms in Agent Systems VI

COIN 2010 International Workshops
COIN@AAMAS 2010, Toronto, Canada, May 2010
COIN@MALLOW 2010, Lyon, France, August 2010
Revised Selected Papers

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# Preface

This volume is the sixth in a series that started in 2005, and it collects papers from the Coordination, Organizations, Institutions and Norms (COIN) workshops http://www.pcs.usp.br/~coin/. The papers in this volume are drawn from the two workshops that took place in 2010.

The development of complex distributed systems consisting of autonomous and heterogeneous agents with diverse knowledge is a challenge: System components must interact, coordinate and collaborate to solve problems that are intrinsically distributed, manage the complexity of task environments, targeting their well-being and persistence via adapted organization and regulation of behaviors. All this must happen in scalable ways. Autonomous and autonomic management of the scale and complexity of contemporary distributed systems requires intelligence; in particular an intelligence that is manifested by individual strategies and/or collective behavior. In such circumstances, system architects have to consider: the inter-operation of heterogeneously designed, developed or discovered components; inter-connection which cross-legal, temporal, or organizational boundaries; the absence of global objects or centralized controllers; the possibility that components will not comply with the given specifications; and embedding in an environment which is likely to change, with a possible impact on individual and collective objectives.

The convergence of the requirement for intelligence with these operational constraints demands: coordination—the collective ability of heterogeneous and autonomous components to arrange or synchronize the performance of specified actions in sequential or temporal order; organization—a formal structure supporting or producing intentional forms of coordination; institution—an organization where inter alia the performance of designated actions by empowered agents produces conventional outcomes; and norms—patterns of behavior in an institution established by decree, agreement, emergence, and so on.

The automation and distribution of intelligence is a crucial subject of study in autonomous agents and multi-agent systems; the automation and distribution of intelligence for coordination, organization, institutions and norms is the focus of the 2010 workshops.

The goal of these workshops is to bring together researchers in autonomous agents and multi-agent systems working on the scientific and technological aspects of organizational theory, electronic institutions and computational economies from an organizational or institutional perspective. Authors of the workshop papers were invited to extend their submitted work on the basis of reviewers' comments and the discussions during the meeting. These papers were reviewed again. The successful papers appear in this volume.

## COIN@AAMAS 2010

COIN@AAMAS 2010 took place on May 11, 2010, as a satellite event of the 9th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2010), in Toronto, Canada. With about 30 participants in each session 35 registered participants, the workshop was an exciting and fruitful gathering where discussions followed the papers presented by an international group of speakers. We had participants from Australia, Italy, The Netherlands, Brazil, New Zealand, Portugal, Spain, UK and USA, to name a few. Of the 21 submissions, 14 were selected for presentation and, subsequently, included in the proceedings. Each paper was assigned three to five reviewers to provide constructive comments and to stimulate discussion.

## COIN@MALLOW 2010

COIN@MALLOW 2010 took place on August 30, 2010, as one of the federated Multi-Agent Logics, Languages, and Organisations Workshops (MALLOW), in Lyon, France. This edition of COIN received 14 high-quality submissions, describing work by researchers coming from nine different countries; eight of the submissions were selected by the Program Committee as regular papers and two were selected by the Program Committee as position papers. Each paper received at least three reviews in order to supply the authors with helpful feedback that could stimulate the research as well as foster discussion. Seven of these papers appear in this volume.

## The Papers

The papers in this volume are extended, revised versions of the best papers presented at the two workshops. The result is a balanced collection of high-quality papers that really can be called representative of the field at this moment. For this volume, the papers have been re-grouped around three themes: *Normative System Design and Modelling*, *Social Aspects* and *Norms at Run-time: Learning and Enforcing*. Here we summarize each of these themes and present a brief summary of the papers.

### Normative System Design and Modelling

All the papers in this section model particular aspects of organizations, normative frameworks, or institutions at design time. The papers range from mechanisms for norm compliance and reputations, specification languages to mechanisms to assist the designer in the realization of prototypical implementation for offline verification of systems.

1. Criado et al., in "Rational Strategies for Norm Compliance in the n-BDI Proposal," present a BDI architecture in which agents can adopt norms autonomously allowing them to reason about the influence of norm compliance and violation with respect to their goals.

2. Köhler-Bußmeier et al., in "Generating Executable Multi-Agent System Prototypes from SONAR Specifications," provide a middleware, MULAN4SONAR, and its prototypical implementation for supporting organizational teamwork in all its various stages. The organizations are modelled using SONAR, a rich and elaborate formalism to provide all the necessary configuration information.
3. da Silva Figueiredo et al., in "Modelling Norms in Multi-agent Systems with NormML," propose a new normative modelling language to specify the main properties and characteristics of norms. Furthermore, they introduce a mechanism to validate the norm specification at design time with respect to possible conflicts.
4. Centeno et al., in "Building Reputation-Based Agreements: Collective Opinions as Information Sources," introduce a reputation mechanism that can be used by organizational models allowing agents to collaborate with better partners. The proposed mechanism collects opinions about agents and provides this information using different informative mechanisms.
5. Corapi et al., in "Norm Refinement and Design Through Inductive Learning," present an inductive logic programming approach for learning normative specifications on the basis of use cases. These use cases present the intended behavior of the system. If a specification does not satisfy the provided use cases, the system will provide the necessary rules or rule updates to satisfy these use cases.
6. Balke et al., in "Using a Normative Framework to Explore the Prototyping of Wireless Grids," present a case study of a normative framework to verify the usefulness of a technique proposed in the wireless grids community. Instead of having mobile phones obtain information only from a given base station, phones are encouraged (via norms) to share data with other handsets on a power-efficient channel.

**Social Aspects**

The papers in this section focus on the inter-relational aspects between agents and/or agents and humans. They study models of interaction, commitment and coherence within the context of MAS, or use mental models or human search behavior to derive decision strategies for agents in a variety of contexts.

1. Martinez et al., in "Towards a Model of Social Coherence in Multi-Agent Organizations," study the dynamics of multi-agent organizations using a model based on social coherence and a simulation framework. The basic component of the model is the notion of social commitment, which is being used to describe all agents' interdependencies. A local coherence mechanism together with a sanctioning policy is then used to ensure social control and emergence of social coherence.
2. Jonker et al., in "Shared Mental Models: A Conceptual Analysis," investigate which concepts are relevant for shared mental models and model how they are related using UML. They develop a mental model ontology that formalizes a shared understanding of tasks between teams of agents and teams of human-agent teams.

3. Boella et al., in "Group Intention Is Social Choice with Commitment," propose a formalization of non-summative group intentions, using social choice theory to derive group goals. The framework combines judgement aggregation as a decision-mechanism with a multi-modal multi-agent logic derived from LTL to represent collective attitudes and all the aspects of group intentions.
4. Johnson et al., in "Coactive Design: Why Interdependence Must Shape Autonomy," introduce the fundamental principles of coactive design. This approach has been developed to highlight the interdependence between the various (groups of) actors, agents and humans, in a given system. The authors conjecture that the increased effectiveness of a human-agent system not only relies on the autonomy of agents but also on their capability of sophisticated interdependent joint activity with humans.
5. Traskas et al., in "A Probabilistic Mechanism for Agent Discovery and Pairing Using Domain-Specific Data," propose a mechanism for agent discovery and pairing using a probabilistic approach with domain-specific data. Agents employ a Bayesian inference model to control the search in a way akin to human disposition to give up after trying a certain number of alternatives and taking the best offer seen. The effectiveness of the proposed approach is demonstrated in identifing good enough solutions to satisfy holistic organizational service level objectives.
6. Wickramasinghe et al., in "An Adherence Support Framework for Service Delivery in Customer Life Cycle Management," propose a conceptual framework to model how deficits in mental attitudes can affect service delivery and propose an adherence support architecture to reduce failures due to such deficits. The effectiveness of this proposal is demonstrated in an MAS for chronic disease management.

**Norms at Run-Time: Learning and Enforcing**

The last group of papers looks at how norms emerge, are updated, discovered, reasoned about or monitored in a running system.

1. Griffiths and Luck, in "Norm Diversity and Emergence in Tag-Based Cooperation," investigate the problem of norm-emergence and group recognition using a tag-based cooperation for interaction. The paper explores the features that affect the longevity and adoption of norms in this type of system and empirically evaluates existing techniques for supporting cooperation when agents violate the norms.
2. Criado et al., in "Norm Enforceability in Electronic Institutions?", investigate the current shortcomings of the Electronic Institution approach for MAS. The proposed method supports enforcement mechanisms for norm execution and observance. The paper looks into complex situations where the system is unable to deal with norm observance in an appropriate manner.
3. Urovi et al., in "Initial Steps Towards Run-Time Support for Norm-Governed Systems," present an initial knowledge representation framework for runtime support of norm-governed systems. The system uses an Event Calculus

dialect for efficient temporal reasoning. The paper provides an experimental evaluation to demonstrate the scalability of the approach through distribution of the infrastructure.

4. Savarimuthu et al., in "Identifying Conditional Norms in Multi-Agent Societies," present a mechanism that allows agents to discover conditional norms in their society at run-time. The paper takes the reader through the algorithms and processes, and demonstrates how an agent could go about adding, modifying or deleting these conditional norms.
5. Campos et al., in "Using a Two-Level Multi-Agent System Architecture to Perform Norm Adaptation in a Peer-to-Peer Sharing Network," present an architecture that endows an organization with self-adaptation capabilities to adapt to the changing context in which it operates. Self-adaptation is proposed as an extra assistance layer on top of the (existing) organization layer.
6. Alvarez-Napagao et al., in "Normative Monitoring: Semantics and Implementation," present a formalism for monitoring both regulative (deontic) and substantive (constitutive) norms based on structural operational semantics. This formalism is reduced to production systems semantics and the authors demonstrate that their implementation is compliant with both semantics.
7. Koeppen et al., in "Generating New Regulations by Learning from Experience," propose an approach, based on utilitarianism, to enhance multi-agent systems with a regulatory authority that generates new norms based on the outcome of previous experiences. For the learning part of their system, the authors employ machine-learning techniques.
8. Boissier et al., in "Controlling Multi-Party Interaction Within Normative Multi-Agent Organizations," present an extension of the normative organization model MOISE to allow for the specification of different interaction modes: direct communication between roles and/or restricted to a group of agents. This allows organizations to monitor interactions between agents, and agents to reason on these modes as they do about norms. The paper focuses on the first point and demonstrates the capabilities provided with a crisis management application.

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March 2011

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