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Policy-Based Instantiation of Norms in MAS



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Policy-Based Instantiation of Norms in MAS

▶ Paper outline

- ▶ A unified format for representing and reasoning about norms
- ▶ A model for working with policies
- ▶ An algorithm for instantiating norms based on context and policies
- ▶ 22

Representation of Norms

- ▶ Deontic Operator
 - ▶ Obligation or Interdiction
- ▶ Target
 - ▶ “who is the norm addressed to?”
- ▶ Evaluator
 - ▶ “in relation to whom?”
 - ▶ Both Target and Evaluator
 - ▶ Specifies a Role in the system
 - ▶ E.g.: client, seller, student, teacher, driver, etc.
- ▶ Pertinence condition
 - ▶ “When is the norm active?”
 - ▶ “When should it be applied?”
 - ▶ Represented as tags
 - ▶ E.g: “departure”, “arrival”, “car.malfunction”, etc.
- ▶ Content
 - ▶ An action
 - ▶ Defined within the set of all possible actions of each MAS Role.

Representation of Policies

- ▶ More than one policy per norm
- ▶ Specified independently by each service provider

- ▶ State
 - ▶ All the possible options
 - ▶ “What is the context when the norm is applied?”
 - ▶ In relation with the pertinence condition:
 - ▶ i.e. “when the pertinence condition holds AND the state of the associated policy is true”

- ▶ Sanction
 - ▶ Usually represented by an amount
 - ▶ Corresponding to a certain state of the policy
 - ▶ In relation with the content of the norm
 - ▶ Is the list of parameters sent to the action representing the content
 - ▶ E.g. `pay(20)`, `inform(Company, NewDestination)`, etc...

Norms and Policies

Norms					Policies	
Deontic Operator	Target	Evaluator	Pertinence Condition	Content	State	Sanction
[Obl/ Int]	[Role]	[Role]	[Tag]	[Action]	[Context]	[Amount]
Obligation	Client	Company	Departure	Pay	carClass == A carClass == B carClass == C	20 15 10
Interdiction	Client	Company	Departure	Sign(contract)	CurrentDate()- client.permit.date < MinumumYearsExpe rience	0
Obligation	Company	Client	Arrival	Inform	NewDestination != Destination	Company, NewDestination
...

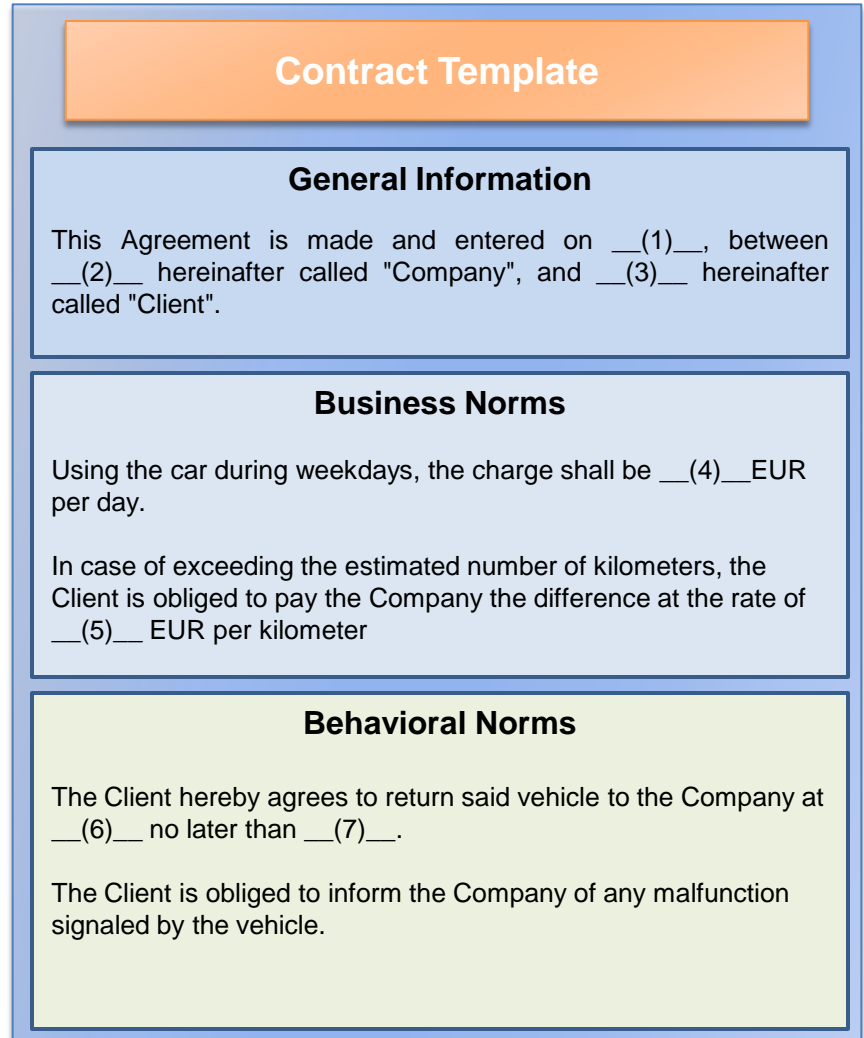
- homogenous representation
- the same set for any company
- define the desired behavior

- high flexibility
- company-specific
- reflect business rules

Contract Template

- ▶ Service-specific
- ▶ Based on the unified set of norms.
- ▶ Acknowledged by all the agents within the system
- ▶ Does not include any values from policies

- ▶ **General Information**
 - ▶ Identification Information
 - ▶ Date, place, rental period, etc.
 - ▶ Template for object description
- ▶ **Business Norms**
 - ▶ E.g. “In case of exceeding the estimated number of kilometers, the Client is obliged to pay the Company the difference at the rate of {AdditionalKmPrice} EUR per kilometer.”
- ▶ **Behavioural Norms**
 - ▶ E.g. “The Client is obliged to inform the Company of any malfunction signaled by the vehicle.”



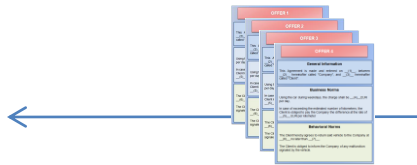


Contract Template

General Information
 This Agreement is made and entered on __ (1) __, between __ (2) __ hereinafter called "Company", and __ (3) __ hereinafter called "Client".

Business Norms
 Using the car during weekdays, the charge shall be __ (4) __ EUR per day.
 In case of exceeding the estimated number of kilometers, the Client is obliged to pay the Company the difference at the rate of __ (5) __ EUR per kilometer

Behavioral Norms
 The Client hereby agrees to return said vehicle to the Company at __ (6) __ no later than __ (7) __.
 The Client is obliged to inform the Company of any malfunction signaled by the vehicle.



OFFER 1

OFFER 2

OFFER 3

OFFER 4

General Information
 This Agreement is made and entered on 09/24/12, between Bob hereinafter called "Company", and Alice hereinafter called "Client".

Business Norms
 Using the car during weekdays, the charge shall be 15 EUR per day.
 In case of exceeding the estimated number of kilometers, the Client is obliged to pay the Company the difference at the rate of 0.25 EUR per kilometer

Behavioral Norms
 The Client hereby agrees to return said vehicle to the Company at Calabria, Italy no later than 09/26/12
 The Client is obliged to inform the Company of any malfunction signaled by the vehicle.
 Etc...

Contract Proposals

- ▶ Produced by the company based on
 - ▶ The request received from the client
 - ▶ The business rules within the Company's policy
- ▶ All charges and sanctions are filled in with actual data
- ▶ The number depends on
 - ▶ the specificity of the request and
 - ▶ The range of offers available
- ▶ It includes negotiation
 - ▶ The company issues various combinations of parameters
 - ▶ The client may choose the most suitable one
 - ▶ Saves the time for other negotiation steps

OFFER 4

General Information

This Agreement is made and entered on 09/24/12, between Bob hereinafter called "Company", and Alice hereinafter called "Client".

Business Norms

Using the car during weekdays, the charge shall be 15 EUR per day.

In case of exceeding the estimated number of kilometers, the Client is obliged to pay the Company the difference at the rate of 0.25 EUR per kilometer

Behavioral Norms

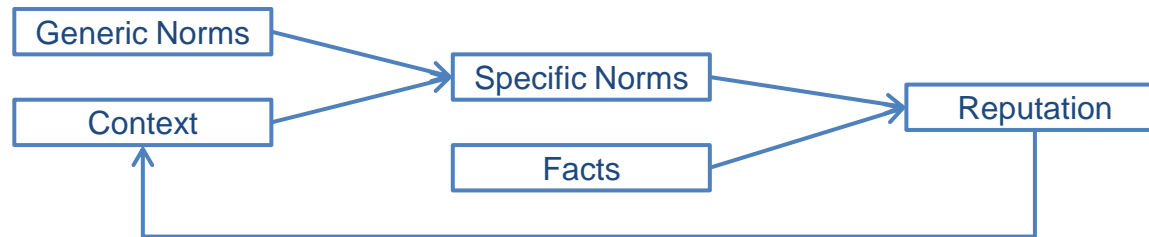
The Client hereby agrees to return said vehicle to the Company at Calabria, Italy no later than 09/26/12.

The Client is obliged to inform the Company of any malfunction signaled by the vehicle.

Etc...

The RESPECT model

- ▶ Uses the normative component described in this paper
- ▶ Based on reputation mechanisms
 - ▶ Reputation is build by compliance with the norms
 - ▶ The Reputation level influences the contract proposals.



Conclusions

- ▶ Unified format for norm description
- ▶ Reduces the complexity
 - ▶ norm propagation
 - ▶ reasoning about norms
- ▶ Norms decoupled from sanctions
- ▶ Flexibility in issuing business contracts
- ▶ Scalable to a large number of service providers
- ▶ Saves negotiation steps
- ▶ Ready to use with reputation mechanisms