



Simulating Working Environments Through the Use of Personality- based Agents

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Summary

- Simulating Human Organizations
- The SimOrg platform
 - T. Millon personality theory
 - Agent Architecture
- The SimOrg simulation
 - Scenario
 - Dynamic aspects of the agents
- Final remarks

Simulating Human Organizations

- Simulation as a tool for understanding a system behavior
 - Continuous construction and evaluation of theories
 - There is no “established” theory explaining human behavior
- Multi-agent approach as a natural way to represent an observed system
 - Individual observations vs. Collective observations
 - How an individual affects the collectiveness, and how the collectiveness affects an individual
- Different individuals in the same role within the organization influence differently the organization
 - Individual personality
 - Importance of using personality model when modelling human organizations

SimOrg

- Each individual is an agent
 - Own personality characteristics, which may be taken into account when an agent is going to act
 - Use of theories from organizational psychology
- Multi-agent system based on a hierarchical representation of structures and activities of an organization
- Project-oriented organizations
 - Projects composed of activities
 - Activities composed of tasks
 - Tasks produces resources, used on other activites
 - Agents performs tasks

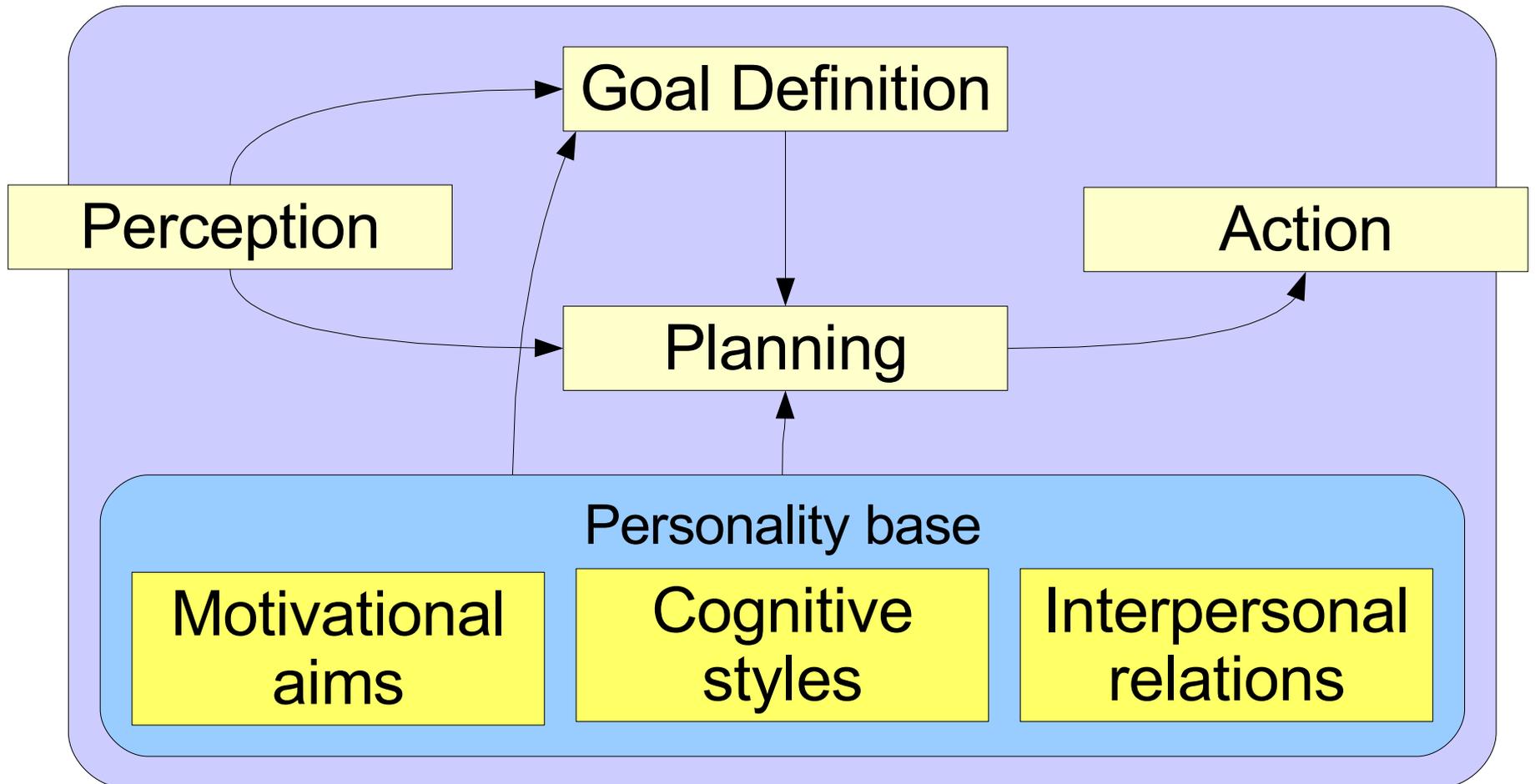
SimOrg Agent's Architecture

- How to make (in the model) different individuals playing the same role inside an organization to perform tasks differently?
 - Some tasks are more "natural" to an individual, according to his/her personality style
- In order to put some "personality" traits, the agent architecture was based on the theory of T. Millon
 - (+) Possible to "quantify" the aspects of the personality
 - (+) Easily added to the decision making process
 - (+) Several aspects of the personality can be easily modeled
 - (-) Large number of personality traits "variables"

Personality Theory of T. Millon

- Measurement to express personality based on 3 areas through 12 bipolar attributes
- Motivational aims
 - Openness vs. Preservation
 - Modification vs. Accomodation
 - Individualism vs. Protection
- Cognitive styles
 - Extroversion vs. Introversion
 - Feeling vs. Thinking
 - Reflection vs. Affectivity
 - Systematization vs. Innovation
- Inter-personal relationships
 - Shyness vs. Communicability
 - Doubt vs. Security
 - Discrepancy vs. Conformity
 - Control vs. Submission
 - Satisfaction vs. Dissatisfaction

The proposed architecture



Simulation scenario

- The context
 - Software development organization
 - Roles, Group goal, Resources availables, Working process
- Simplified software development process
 - Actions
 - estimate time, design, code, test code, validate design
 - Activities
 - time estimation, design, development, project evaluation
 - Roles
 - Manager, Designer, Developer
 - Formal and informal interactions
 - Subset of ACL structure: performative, sender, receiver, content
 - Added 2 components: quality, importance

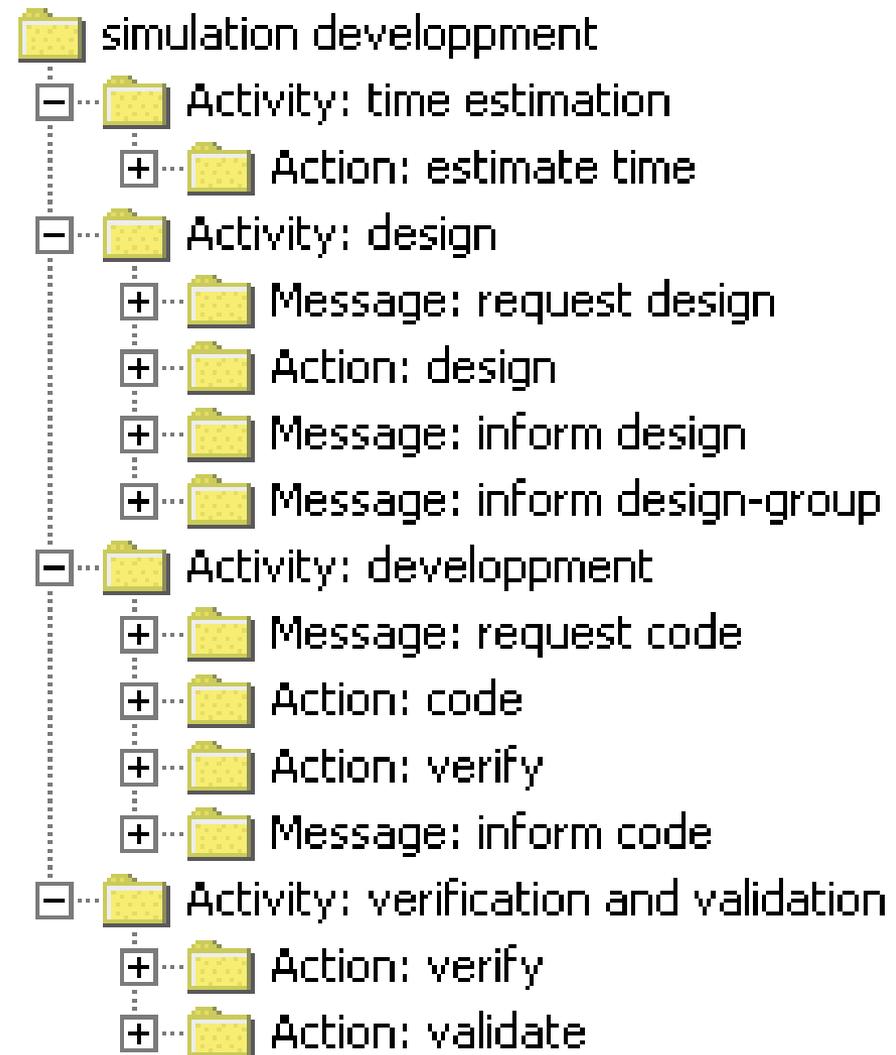
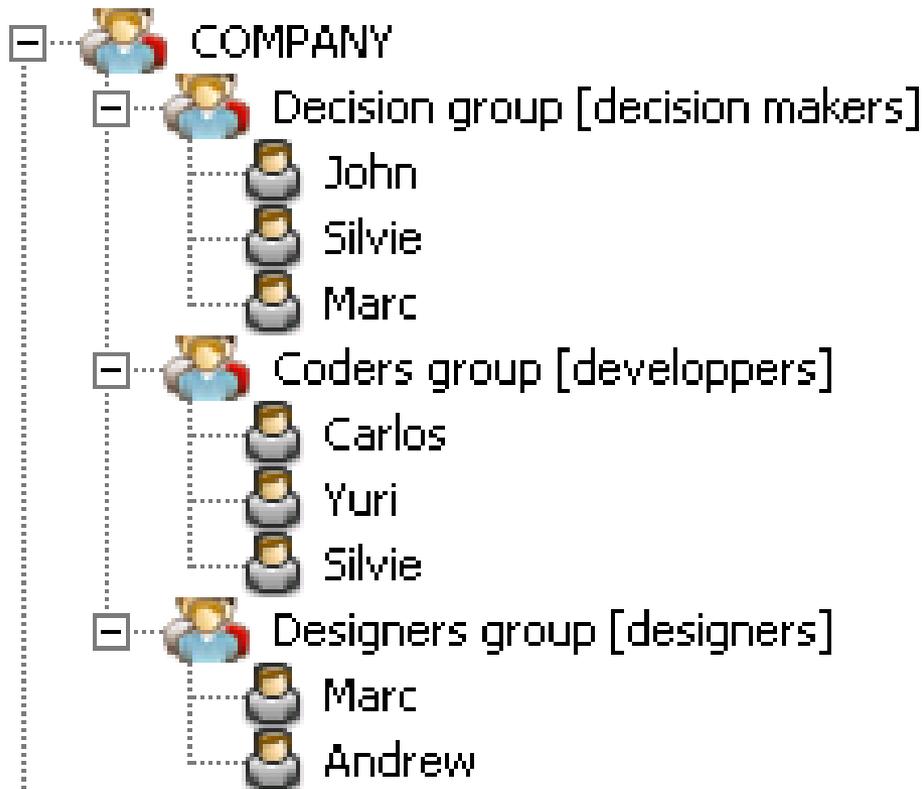
Simulation scenario specification

- Configurable scenarios (defined in a XML file)
 - Organizational structure (individuals, roles etc)
 - Working process (activities, tasks, dependencies etc)

```
■ <organization name="company name">
    <group name="Decision group" type="decision makers" >
        <agent-role agent="John" role="manager"/>
        <agent-role agent="Marc" role="designer"/>
        <agent-role agent="Silvie" role="developper"/>
    </group>
</organization>

■ <process>
    <activity name="time estimation" responsible="decision makers">
        <action name="estimate time">
            <executor group="decision makers" role="manager"/>
        </action>
    </activity>
</process>
```

Simulation scenario overview



Dynamic aspects of the agents

- SimOrg Agents don't simulate robots
 - Agent may perform actions unefficiently
- Quality of action
 - Personality suitability
 - Suitability of an individual to perform an action according to its personality traits
 - Motivation parameter
 - How motivated is the agent to perform such an action
 - May be related to several factors: work pressure, fatigue, etc
- Time expended for finishing a task depends on the actions' quality
- Actions are configurable by script (BeanShell)

The use of stereotypes

- Millon's theory is complex (several attributes) for evaluating purposes
- Categories of personality -> stereotypes
 - Smaller "variable set" for studying
 - Based on a database of 3000 individuals' evaluations
 - Represents standard profiles of individuals within an organization
- Examples
 - Leader, Perfectionistic, Optimistic, Cooperative etc.
- Help the end-user to use the simulation
 - Pre-defined set of values for the personality

SimOrg Simulation

- Interactive simulation
 - Set of user actions -> feedback over the user' actions
 - Used on a post-graduation course: IT Management
 - **How to motivate groups**
 - Increase wage
 - Individual recognition
 - To increase/reduce work preassure
 - Make a promotion
 - Hire / Dismiss an employee
- Non-interactive simulation
 - Evaluate the performance of an agent (taking into account its personality) according to its activities

SimOrg Simulation

SimOrg File Options

SimOrg - Simulation

View Employees Activities

COMPANY

- Decision group [decision makers]
 - John
 - Silvie
 - Marc
- Coders group [developpers]
 - Carlos
 - Yuri
 - Silvie
- Designers group [designers]
 - Marc

New Group

Hire Employee

Organization Chart

```

    graph TD
      DG[Decision group decision makers] --> J[John manager]
      DG --> S[Silvie developer]
      DG --> M[Marc designer]
  
```

Legend

- Marc
 - To increase wage
 - Individual recognition
 - To increase work rhythm
 - To reduce work rhythm
 - Promotion

STEP Days 10 of 150

Employee Group Company History

Agent

Name: Marc
 Category: JUNIOR
 Personality Stereotype: perfectionist

Groups

Groups	Roles
Decision group	designer
Designers group	manager

History

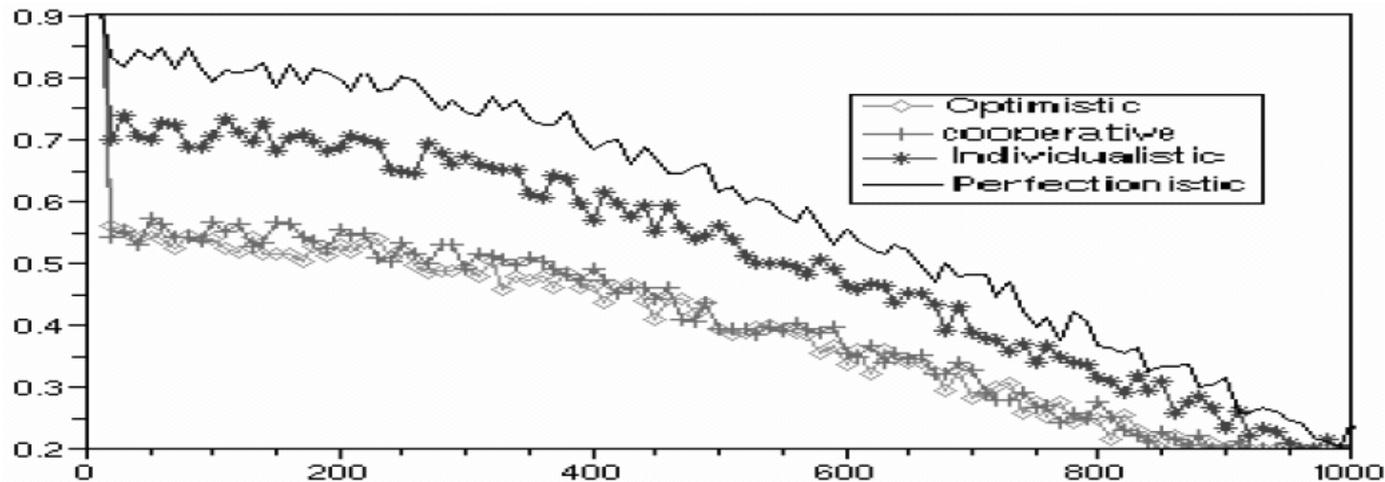
Events	Dates
request design	Day: 1 hour: 2
design	Day: 1 hour: 3

Action

Action	Progress
design	[Progress bar]
code	[Progress bar]
estimate time	[Progress bar]
verify	[Progress bar]
validate	[Progress bar]

Example of agent behavior

- Non-interactive simulation
 - No “motivation” generated by the user
 - Quality of an action decreases with the passing time



Final remarks

- SimOrg
 - a configurable tool for simulating working environments where individuals are represented as personality-based agents
 - Project-oriented human organizations
 - Structured planning (activities, tasks, resources etc)
- Personality of an agent and its suitability to a task can be easily defined by an application
- Human organizations are a rich environment for studying
 - Wide range of organizations and analysis can be done



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