Concepts, Techniques and Tools for an Educational Modeling Language

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Objectives/outline

- Presentation of the CPM language
  - Context, initial objectives, orientations
  - Existent modeling languages/CPM position
  - The Semantic Information Model
  - Experimentation, Use Cases
  - Dedicated CASE-Tool
  - Binding facility

- Comparison between CPM and the IMS-LD specification

- Conclusion/perspectives

- Demo
Context, initial objectives, orientations

- **Context** (Ph.D.)
  - Distant learning
  - Instructional design models
  - Exploring potential addons of **UML (meta)-modeling** for the **design** and **implementation** of co-operative Problem-Based Learning situations (PBL)

- **Objective/realization**
  - To propose a **graphical** modeling language, **UML-based**, and dedicated to PBL

→ the **CPM** language
Existent modeling languages/CPM position

- CPM language → instructional engineers (with pre-requisite to know UML modeling bases)

- CPM models → multidisciplinary designers’ team
The Semantic Information Model

- **Syntax** (presented at [ICCI,03])
  - Abstract (terminology): CPM meta-model
    - UML-independent
    - 35 concepts
  - Concrete (notation):
    - CPM profile extending UML
      - Stereotypes
      - Tagged values
    - Preferred diagrams:
      - Class, Use case,
      - Activity, States

- **Semantics**
  - Natural language
  - OCL rules

[Diagram showing the relationship between M0, M1, M2, M3, MOF, UML, CPM meta-model, CPM profile, and CPM models]
Experimentation, Use Cases

- Exploring expressiveness thanks to the SMASH case-study

Definition of:
- Objectives
- Task
- Success criteria
- Obstacle
- Preliminary roles
- ...

Detailed analysis of:
- Roles
- Resources
- Activities
- Knowledge
- ...

Scenario specification:
- Roles, resources
- Individual activities
- Collaborative activities
- Cooperation
- Event management
- ...

Model = set of views
View = set of diagrams

Initial requirements → Analysis → Design
Experimentation (2): just one example
Dedicated CASE-Tool

- CPM profile integrated as a module for the *Objecteering* UML CASE-tool
- Customized and adapted HMI
- New end-users functions

*Authoring environment prototype for instructional designers*
Binding facility

- Experimentation of models transformation

Why?

- To extend CPM language uses
- To provide CPM models with an ODL platform-implementation facility

How?

- CPM activity diagrams modeling learning scenarios
  - Stereotypes and tagged values (extension elements from CPM profile) inform and guide transformations
- XML models conform to IMS-LD spec
Binding facility (2): simple example

**CPM model**

Element information:
- Stereotype `<<Role>>`
- Tagged Value RoleKind=`learner`

**IMS-LD model**

```
<learning-design identifier="LD-essaiFromCPM" uri="URI" level="A">
    <title>CPM2IMSLD_example</title>
    <learning-objectives/>
    <prerequisites/>
    <components>
        - <roles>
            <learner identifier="Student"/>
        </roles>
        - <activities>
            <learning-activity identifier="Repondre QCM"/>
            <activity-description>
                <item identifierref="" identifier="Id-Repondre QCM"/>
            </activity-description>
            </learning-activity>
        </activities>
        <environments/>
    </components>
    <method>
        - <play identifier="PLAY-exple simple" isvisible="true"/>
        - <act identifier="ACT-Repondre QCM"/>
        - <role-part identifier="RP-Student">
            <role-ref ref="R-Student"/>
        </role-part>
        </act>
        <complete-play>
            <when-last-act-completed/>
        </complete-play>
    </method>
</learning-design>
```
<table>
<thead>
<tr>
<th>Language</th>
<th>CPM</th>
<th>IMS-LD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main goals</td>
<td>Communication, abstraction</td>
<td>Interoperability, reuse, exchange</td>
</tr>
<tr>
<td>Kind</td>
<td>Semi-formal (graphical)</td>
<td>Formal</td>
</tr>
<tr>
<td>Terminology</td>
<td>CPM meta-model</td>
<td>IMS-LD information model</td>
</tr>
<tr>
<td>Notation</td>
<td>UML Profile CPM</td>
<td>none</td>
</tr>
<tr>
<td>Target audience</td>
<td>Instructional engineer knowing bases of UML</td>
<td>Instructional engineer trained to IMS-LD</td>
</tr>
<tr>
<td>Concerned steps</td>
<td><strong>Initial requirements, analysis and design</strong></td>
<td><strong>Detailed design</strong></td>
</tr>
<tr>
<td>Type</td>
<td>UML models</td>
<td>XML Models</td>
</tr>
<tr>
<td>Target audience</td>
<td><strong>Multidisciplinary staff in charge of design process</strong></td>
<td>Machine</td>
</tr>
<tr>
<td>Tools</td>
<td>One prototype</td>
<td>Several prototypes</td>
</tr>
</tbody>
</table>
Conclusion

- CPM Language
  - UML-based EML
  - Dedicated to PBL
  - Binding facility
## Positive/negative points of this UML approach for EML

<table>
<thead>
<tr>
<th>✓ Positive Point</th>
<th>✓ Positive Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Graphical language</td>
<td>✓ Upstream IMS-LD</td>
</tr>
<tr>
<td>✓ Models address multidisciplinary design team</td>
<td>✓ Lack of methodology</td>
</tr>
<tr>
<td>✓ Object-based approach</td>
<td>✓ UML notation extension is limited</td>
</tr>
<tr>
<td>✓ UML methods/techniques/tools could be exploited</td>
<td>✓ Instructional engineers’ pre-requisite to be “UML-aware”</td>
</tr>
<tr>
<td>✓ Explicit modeling of information thanks to stereotypes &amp; tagged values</td>
<td>✓ Difficulty to create specific tools from scratch</td>
</tr>
<tr>
<td>✓ Roles of UML Profiles in the MDA framework</td>
<td></td>
</tr>
</tbody>
</table>
Perspectives

- **CPM point of view:**
  - To make experimentations in cooperation with target-publics
  - To propose a specific method
  - To improve models transformation

- **IMS-LD point-of-view:**
  - Benefits of a UML-profile dedicated to IMS-LD?
  - Benefits of a UML-based authoring-tool for IMS-LD?
Demonstration
Concepts, Techniques and Tools for an Educational Modeling Language

Thank you

Q&A

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