Seqins
A Sequencing Tool for Educational Resources

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Seqins

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2. Seqins
   1. Architecture
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3. Ensemble integration
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Motivation

Teaching-Learning process

- Student-centered
- Combination of paradigms: learning by viewing vs. by doing
- Educational resources: available and diversified
- E-Learning tools: ubiquitous and interoperable

Sweller and Cooper (1985)
Motivation

Ensemble framework
- Conceptual tool for networks of e-learning services in domains with complex evaluation
- Specialization in the Computer Programming domain
- Validation at ESEIG (an IPP school)

Learner centered approach

E-Learning Tools
- Assessment
- Resolution
- TA
- Storage
- Management

Educational Resources
- evaluation (exercises)

Learning by Doing

Ensemble instance (ESEIG, 2011/12)

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Motivation

Integration of the sequencing tool in the Ensemble instance

- Requirements:
  1. Sequencing tool
  2. Standards for sequencing and integration
  3. Expository resources

Ensemble instance (ESEIG, 2011/12)

Ensemble instance (ESEIG, 2013)
Motivation

Sequencing standards

- Resources sequencing in learning environments
- Criticisms
  - Modularization - included in Learning Objects (IMS CP)
  - Scope - widen excessively the scope ("spray and pray")
  - Utility - more focused on quantity ("shovelware")
  - Complexity - difficult to implement
- Example: IMS (Simple) Sequencing
Tools integration standards
- Ad hoc solutions
- Proprietary plugins (Moodle Repository API)
- Focus on interoperability: IMS Learning Tools Interoperability
Seqins

- Web application for sequencing educational resources
  - Expository (videos, PDF, HTML + images)
  - Evaluation (exercises, tests)
- Simple sequencing model
- Standard communication between e-learning systems
  - Evaluation tools
  - Repositories
  - Learning Management systems
  - ...

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Architecture

Diagram of the Seqins architecture, showing the interaction between the Browser, LMS, Evaluator, GWT, LTI wrapper, Servlet container, Core, JAXB, and Repository components.
Entities

- Student
  - Identification (LTI context variables)
  - State: last resource consulted (or solved) and date

- Course
  - Organized in units (or modules)
  - Each unit contains a set of resources
  - Each resource contains an URL and an weight
Excerpt from a module of a C# course

```xml
<?xml version="1.0" encoding="UTF-8"?>
<unit id="1" title="Intro to C#" minWeight="70">
  <resource title="Primeiro programa - Ola Mundo!"
    type="exp" weight="0" href="..."/>
  <resource title="Ola ESEIG!"
    type="eval" weight="40" href="..."/>
  <resource title="Constantes e operadores aritmeticos"
    type="exp" weight="0" href="..."/>
  <resource title="Area de um circulo"
    type="eval" weight="30" href="..."/>
  <resource title="Hipotenusa de um triangulo"
    type="eval" weight="30" href="..."/>
</unit>
```
Simple sequencing model

- Weights associated with the evaluation resources of an unit
- Sequential visualization and resolution within an unit
- To obtain success in an unit $U'$

$$\sum_{i=1}^{U'\text{length}} wR_i \in U' \geq mwU'$$

- Competitive facet
  - Success to a unit unlocks access to the next unit
  - "À la" computer games
Seqins integration in an Ensemble instance

- Apply Seqins in the field of computer programming
- Integration at two levels:
  1. Communication
  2. Data
1. Communication

- Based on LTI 1.1 specification
- REST as the web service flavour
- Bidirectional communication
- LTI functions:

<table>
<thead>
<tr>
<th>Function</th>
<th>REST</th>
<th>LTI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Basic</td>
</tr>
<tr>
<td>Launch</td>
<td>POST TA_URL &lt; LTI_PARAMETERS</td>
<td>yes</td>
</tr>
<tr>
<td>ReplaceResult</td>
<td>POST LIS_OUTCOMES_URL &lt; LIS_SOURCE_ID + GRADE</td>
<td>no</td>
</tr>
<tr>
<td>ReadResult</td>
<td>POST LIS_OUTCOMES_URL &lt; LIS_SOURCE_ID &gt; GRADE</td>
<td>no</td>
</tr>
<tr>
<td>DeleteResult</td>
<td>POST LIS_OUTCOMES_URL &lt; LIS_SOURCE_ID</td>
<td>no</td>
</tr>
</tbody>
</table>
1. Communication

- Data sent by Tool Consumer (LMS/Seqins)
  - Course/Activity (id, title, description)
  - Student (id, name, email)
  - Other data (OAuth, dates, etc.)
- Data sent by Tool Provider (TA/Seqins)
  - Grade
2. Data - expository resources

- Essentially videos
- Created in Screen-o-matic
- Shared with YouTube

Features
- Cover all topics
- Different difficulty levels
- Short clips of video (< 5’)
- Complete (images, sound, subtitles, layers)
2. Data - expository resources

- Programming exercises
  - Based on IMS CC specification
  - Extended through a LAO (PExIL)
  - Created in Petcha (TA)
  - Stored in CrimsonHex (LOR)
GUI
Future work

1. Create a MOOC about computer programming
   - Create more expository resources
   - Improve graphical interface

2. Extend sequencing model
   - Alternative paths
   - Recommendation
Thanks!

Questions?

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