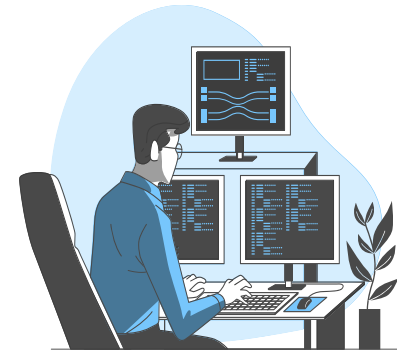


Knowledge – Based Semi – Automatic Selection of Personalized Learning Paths

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Agenda



INTRODUCTION

ADAPTIVE LEARNING AND PERSONALIZED PATHWAYS

**KNOWLEDGE MODEL FOR SEMI-AUTOMATIC LEARNING PATH
GENERATION AND SELECTION**

DISCUSSION

CONCLUSION

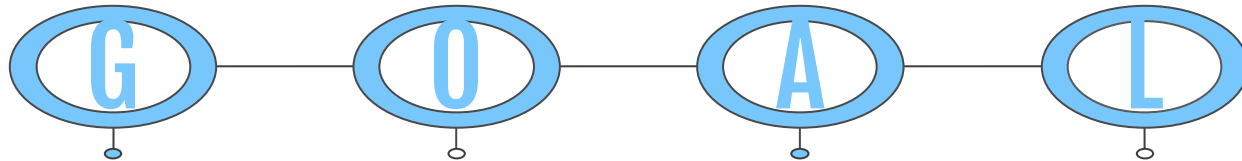


INTRODUCTION



Our goals are:

- To analyze the automated generation or selection of personalized learning pathways for improving e-learning results;
- To discuss possibilities to combine professional recommendation of individual or group pathways with free choice of the next knowledge objects by the learners, having insufficient learning results;
- To propose a knowledge model for ensuring adequate recommendation of dynamically-generated learning pathways and storing of various approved and well annotated learning paths for future reuse.





ADAPTIVE LEARNING BEHAVIOR AND ADAPTIVE CONTENT

Components for adapting: content, learning activities, interface, evaluation,

Levels of the adaptation process: Curriculum level, Task level and Step level.

Adaptive behavior can be related to:

- Selection of items to present (content-based, presentation –based);
- Ordering information by type (e.g., examples, theory, explanation);
- Creating different navigation paths;
- Selection of different navigation paths.





ADAPTIVE LEARNING TECHNIQUES AND APPROACHES



Adaptation in E-learning environments according to the used technological approaches:

- Adaptation, based on Adaptive hypermedia;
- Implicit semantics-based adaptation (using neural network-based models);
- Explicit semantics - based (including ontology-based recommendation or creation or selection of individualized learning path).

Adaptation approaches of E-learning environments according to the adaptation goals:

- Competency Based Approach - offering individualized learning path for the acquisition of the competence.
- Learning style – based;
- Learning Performance – based;
- Emotions and focus of attention.





Algorithms and Technologies for ensuring PERSONALIZED PATHWAYS

Used types of algorithms and technologies in adaptive e-learning systems can be classified in the following categories:

- Strategies of Selection of different navigation paths are defined as XML (Extensible Markup Language) files;
- Based on collaborative filtering;
- Adaptation, based on neural networks;
- Based on genetic algorithms;
- Heuristic and metaheuristic approaches - based;
- Semantics- based approaches - based;
- Rule-based approaches .





ADAPTIVE MODELS AND ARCHITECTURES

According to the system architecture and main purpose

- Adaptive hypermedia systems;
- Recommender systems ;
- Intelligent tutoring systems;
- Online learning systems .

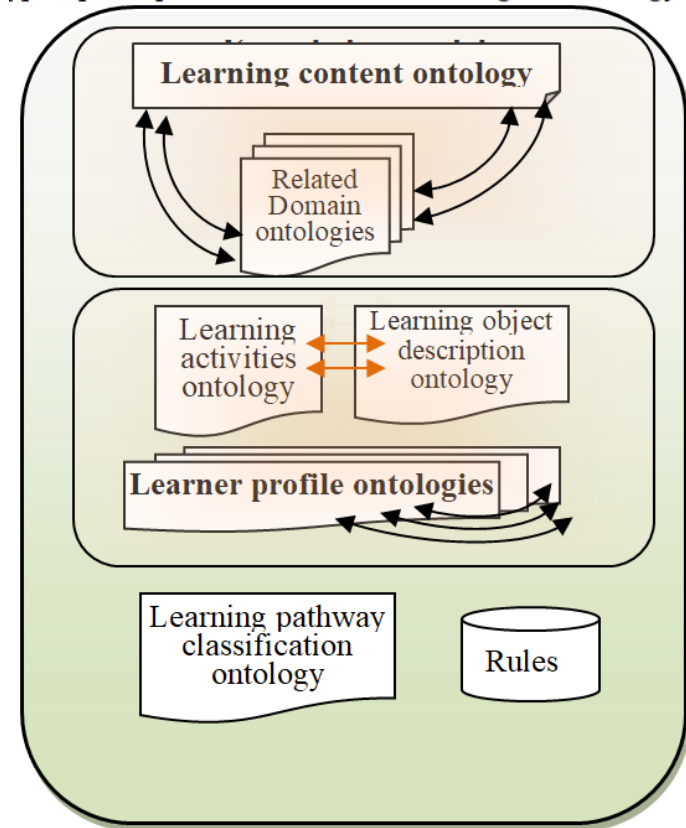
Three main semantics-based knowledge models were used:

- Ontology – based;
- Knowledge graph – based;
- Concept map-based.

KNOWLEDGE MODEL FOR SEMI-AUTOMATIC LEARNING PATH GENERATION AND SELECTION

Our model contains the following ontologies:

- Learning Content ontologies (LCO);
- Learning objects description ontology (LODO);
- Learning pathway classification ontology (LPCO);
- Educational activities ontology (EAO);
- Learner profile Ontologies (LPO).



ONTOLOGIES

Learner profile ontologies contain information about learners as:

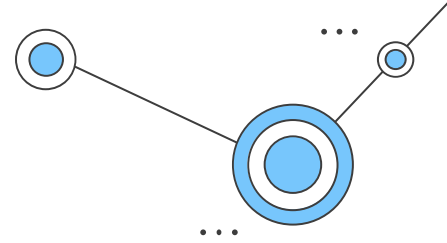
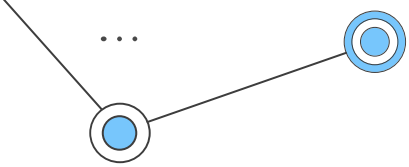
- Preferences or learning disabilities;
- Learning styles;
- Prerequisite knowledge level;
- External interests;
- Future reading.

Learning objects description ontology is a semantic model of information about:

- Educational metadata standard;
- Prerequisite information;
- Precedence information;
- Resource classification;
- Frequency of usage by groups of learners.

Learning pathway classification ontology is a classification scheme of the generated learning pathways as:

- Dynamically generated and developed by professionals;
- For specific type learners;
- Including additional sources or not;
- Including external sources or not.





DISCUSSION

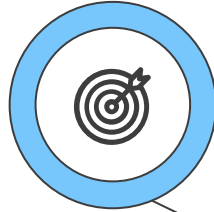


- The proposed knowledge model is very flexible and modular, as it gives possibilities to include or exclude learning content or learner description sub-ontologies by using ontology mapping.
- It can be easily adapted for description of learning contexts in various intelligent tutoring or resource recommendation systems.
- The proposed knowledge model can be used for generating, storing, searching and recommending learning paths in personalized learning and tutoring.
- Educators can develop manually some other possible learning paths and store them in the Learning pathway classification ontology. All the metadata, describing learning paths, stored in the Learning pathway classification ontology defines and stores the learning path's context.
- Agent-based architecture of the ITS is the most suitable for implementing semantics-based recommendation or tutoring systems.

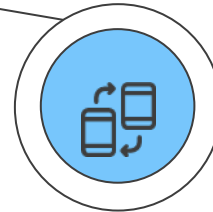


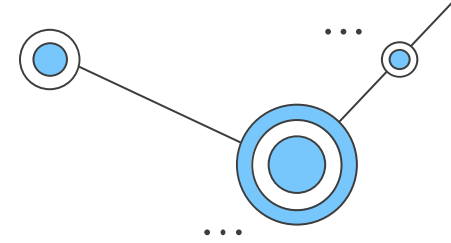
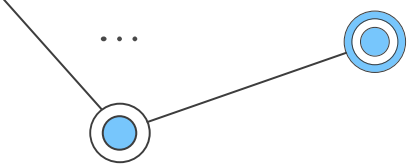
CONCLUSIONS

In this research we propose a knowledge model for semantic description of objects and participants in the e-learning process that can be used for dynamic learning path generation and selection in personalized learning.



Our ontology-based knowledge model and rule-based reasoning implemented in agent-based architecture can support active participation of learners in finding and selection of suitable learning content, corresponding to he's current learning interests and needs.





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