

# A Personalization Model for Learning Objects in Mobile Learning Environments

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**Abstract:** In this paper we present a personalization model for learning objects in mobile devices, which consists of a deductive database and a software component that keeps the learner model updated based on the interaction of the user with the learning environment. This model is developed under the Answer Set Programming paradigm. The model stores and deduces the interests and capabilities of the learner based on her selections and use of learning objects in mobile devices. This personalization model is part of ARMOLEO, our proposal of architecture to design and utilize learning objects in mobile learning environments [1][3].

**Keywords:** Mobile Learning Objects, Personalization, Personalized Learning, Mobile Learning Environments, Learning Objects.

## Introduction

Mobile learning is supported by several learning approaches [4]. We have been considering Situated Learning, Collaborative Learning and Personalized Learning as the foundation of our proposal for Learning Objects (LOs) for Mobile Learning Environments [1][2][3]. For us a LO, when it is aimed to be used in a mobile learning environment, should be enhanced taking into account the special features of mobile technologies, i.e., the learning approaches and perspectives of interaction of Mobile Learning [2]. In this paper we present a personalization model for mobile learning contents based on the Answer Set Programming paradigm that we have implemented in ARMOLEO (ARchitecture for MObile LEarning Objects), our proposal for the development and utilization of learning objects in mobile learning environments [3].

## 1. The Personalization Model

In ARMOLEO, the personalization model implies a learner model implemented using a deductive database, together with the software component responsible to keep the learner model updated based on the interaction of the user with the learning environment. We believe that logic programming based on Answer Set Programming (ASP) is suitable to implement the software component of our personalization model. DLV is a programming system based on ASP. Our DLV model is tested and controlled by NORIKO, a *Non-monotonic Reasoning software component for Intelligent Knowledge awareness and recommendations On the move*, that we have developed in Java. NORIKO allows the Java programmer to add, remove and manipulate beliefs, as well as making queries concerning

the basic and derived beliefs of the model. NORIKO calls DLV automatically in order to perform a belief revision process every time a new basic belief is added or removed.

## 2.2 Some Rules of the Personalization Model

Table 1 shows some belief and commitment generation rules of our Personalization Model. They were developed and tested using NORIKO.

Table 1. Some rules of the personalization model

Rule	Description
<b>capability</b> ( <i>LearnerId, KnowledgeElementId</i> ):- <i>hasAccomplishedTask(LearnerId, TaskId),</i> <i>knowledgeUsedInTask(KnowledgeElementId, TaskId).</i>	The system (agent) believes that the learner is able to apply the knowledge represented in the learning object, based on the results of a learning task (questionnaires, etc.)
<b>LearningObjectContentRecommendation</b> ( <i>LearnerId, LearningObjectId, ContentId</i> ):- <i>hasInterestInTopic(LearnerId, TopicId),</i> <i>topicOfKnowledge(TopicId, KnowledgeElementId),</i> <i>knowledgeRepresentedInObject(KnowledgeElementId, LearningObjectId),</i> <i>learningObjectContent(LearningObjectId, ContentId),</i> <i>knowledgeRepresentedInContent(KnowledgeElementId, ContentId),</i> <i>not capability(LearnerId, KnowledgeElementId).</i>	The system (agent) commits itself to make a recommendation of a specific learning object to a specific learner, according to her interests and/or capabilities, is generated by this rule.
<b>haveToMakeAwareOfLearningObject</b> ( <i>LearnerId, KnowledgeElementId, LearningObjectId</i> ):- <i>hasInterestInTopic(LearnerId, TopicId),</i> <i>topicOfKnowledge(TopicId, KnowledgeElementId),</i> <i>knowledgeRepresentedInObject(KnowledgeElementId, LearningObjectId),</i> <i>not haveInteractedWith(LearnerId, LearningObjectId).</i>	The system (agent) commits itself to make aware the learner about those learning objects of her/him interest that are available in the repository.

## Conclusions

Learning Objects for mobile devices require to be developed and used together with a personalization model, since the mobile device is a very personal device. A deductive database, implemented in DLV, has been useful for creating and maintaining a learner model for the personalization of learning objects. NORIKO has been a useful software component that allows the Java programmer to develop personalized learning object applications.

## References

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