Chapter 82
Ontology-Based Multimodal Language Learning

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ABSTRACT

L2 language learning is an activity that is becoming increasingly ubiquitous and learner-centric in order to support lifelong learning. Applications for learning are constrained by multiple technical and educational requirements and should support multiple platforms and multiple approaches to learning. This chapter investigates the possibility of applying ontology-based, dynamically generated learning objects implemented on a cloud computing infrastructure in order to satisfy these requirements. Previous work on using mobile learning objects is used as a starting point in an attempt to design a system that will preserve all of the advantages of utilizing learning objects, while eliminating any flaws and maximizing compatibility with existing systems. A model of a highly modular, flexible, multiplatform language learning system is presented along with some implementation remarks and advices for future implementation.

INTRODUCTION

Modern society is constantly in a state of flux, and changing lifestyles impose the development of new paradigms in the field of education. Language learning is an especially vibrant area, since learners are not limited by previous education, age, or profession. Mobile technologies are only the latest ingredient in a dynamic socio-technological landscape, allowing learners to control the preferred pace and the location of learning. This is a large step towards achieving omnipresent learning or "learning at any place, any time" (Holzinger, Nischelwitzer, Friedl, & Hu, 2010). With learning often being performed on the move, the challenge is to integrate learning processes across all environments in order to provide a true ubiquitous learning experience.

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Language learning applications can appear in several forms - as desktop, mobile, and Web applications. Although many such applications are designed for a single platform, there is a tendency of convergence towards Web-centric solutions accessible from all platforms and devices. This underlines the problem of adaptation of learning processes and educational materials for a specific platform. Language learning applications should attempt to provide seamless integration across all domains, preferably by operating on an established core of common principles.

Designers of language learning applications need to adjust the learning environment and the presentation of educational content in order to find an optimal model of interaction with the users. Richer forms of content (images, audio, video) can enable multimodal learning and are especially helpful to less motivated learners. Methods of delivery, storage and presentation need to be adjusted to the capabilities of specific platforms and devices, as well as the cognitive capacity of learners, which might be limited in some contexts. Learning objects are a suitable concept for encapsulation and delivery of independent, reusable educational resources with a specific educational goal (McGreal, 2004). Learning objects are somewhat flexible since they can be aggregated into larger educational units, but are still strictly limited by their data model and by various technical constraints inherent to their design. In order to support a truly multimodal, multiplatform, ubiquitous learning experience, additional flexibility is required at all levels of design and implementation.

Rigid models designed for a specific purpose or platform can be replaced with a richer description of the language learning domain using ontologies. An ontology represents an open vocabulary, a model to describe the world using types, attributes, and relations, at any level of detail desired. The downside of using ontologies is the increased complexity of both the design and the implementation. A more complex model will produce more complex information resources, requiring an appropriate storage system and access methods in order to satisfy client applications. A cloud-based infrastructure presents itself as an appropriate solution for a Web based, interconnected, ontology application that caters to different client applications and provides a multitude of services that operate on common data standards.

This chapter explores the possibility of using an expandable, evolving ontology of language concepts in order to describe the language-learning domain and provide a basis for generation of learning objects and provision of language learning services. The main aim was to design a model for a language learning system that can satisfy several key requirements - to be usable on various platforms, to provide for different learning processes, and to allow unlimited expansion according to developing needs. The resulting model relies on several established theoretical concepts and practical technologies, including learning objects, ontologies, cloud computing, and Web services.

LITERATURE REVIEW

Modern computing devices vary both in size and hardware characteristics, as well as in platform architectures utilized. Most of these devices are capable of supporting various applications and processes, with even the smallest devices being capable of accessing the Internet and utilizing remote resources or processing power. This has also influenced the development of software, bringing about a diversification and specialization of applications for certain platforms, as well as the opposite process of unification through Web-based services and interfaces.

New possibilities such as seamless and ubiquitous language learning are being made possible thanks to the improved power and connectivity of modern mobile platforms (Ogata & Yano, 2003).