



The implementation of adaptation methods and techniques to build an individualized course.

Mohamed Benfarha * and Mohammed Sefian Lamarti

A research team in Computer Science and University Pedagogical Engineering, The Laboratory of Applied and Didactic Sciences (LASAD) Higher Normal School of Tétouan, Abdelmalek Essaadi University, Morocco.

<https://orcid.org/0009-0008-5532-4471>

m.benfarha@uae.ac.ma

Abstract. Adaptive hypermedia in education is a form of hypermedia designed to dynamically adapt and deliver personalized content in real time, based on the use of an adaptive model to describe learner characteristics and preferences, and on adapting personalized content according to learners, in order to improve learning efficiency and learning experience. Adaptive hypermedia is a promising avenue for educational research, but the development of adaptive hypermedia systems still faces challenges, including modeling learner preferences and designing effective adaptation strategies. This article is interested in the functions of hypermedia, proposes a set of methods and techniques of adaptation, and proposes a classification of hypermedia systems in education to describe the most important of them.

Keywords: adaptive hypermedia, adaptation methods, adaptation techniques, classification of adaptive hypermedia systems.

1 Introduction

Hypermedia systems have become increasingly popular in recent years as information access tools. Recent works show that adaptive hypermedia systems can improve the efficiency of learning by adapting the content and the interface according to the needs, preferences and skills of each learner. They provide a personalized and more engaging learning experience, which can improve motivation and knowledge retention, [1]. According to Brusilovsky, P., & Peylo, C. (2003). Adaptive hypermedia is an approach that involves adapting the interface and content of a hypermedia information system according to needs, preferences and context of the learner, [2]. For this, several methods and techniques can be used. Using these methods and techniques, it is possible to design adaptive hypermedia-based information systems that adapt to the needs, preferences and context of each learner, thus providing an optimal experience. Our work is interested in its theoretical framework in the functions of hypermedia and proposes a set of methods and techniques of adaptation, and proposes a classification of hypermedia systems in education to describe the most important of them.

2 Theoretical frameworks

The theoretical framework of educational hypermedia is based on several theories of learning, communication and information technologies.

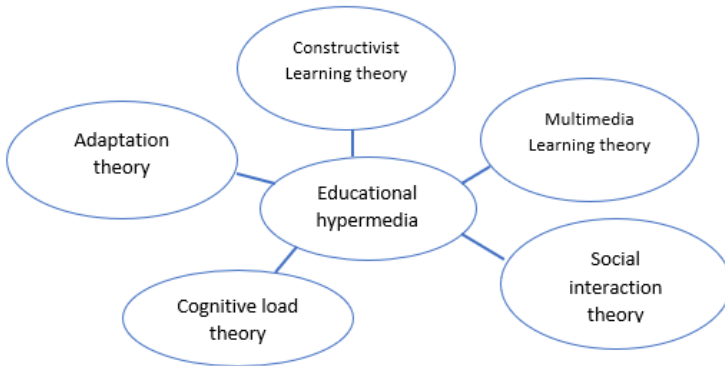


Figure 2: The theoretical framework of educational hypermedia

Using these theories as a frame of reference, educational hypermedia designers can create effective, interactive, and personalized learning environments that convey the learning experience and knowledge retention.

- The theory of cognitive load

This theory holds that learning is supported by cognitive load, that is, the amount of mental effort required to process the information received. Learning environments should be designed to reduce cognitive load by simplifying tasks and organizing information in a coherent and logical way.[3]

- The theory of adaptation

This theory holds that information systems must adapt to the needs and preferences of learners to improve the user experience. In the context of learning, this theory emphasizes the importance of personalizing the learning environment to meet the individual needs of learners.[4]

- Multimedia learning theory

this theory holds that learning is more effective when presented in multimedia form (text, images, video, audio) rather than text alone. This theory emphasizes the need to integrate different types of media into learning environments to facilitate understanding and retention of concepts.[5]

- Constructivist learning theory

This theory holds that learning is an active and interactive process in which learners construct their own understanding of concepts by building on their prior knowledge and making connections between new known concepts and knowledge.[6]

- The theory of social interaction

This theory highlights the importance of social interactions in learning. She argues that learning is enhanced through participation in social and collaborative activities, such as discussing and sharing ideas with other learners.[7]

2.1 The functions of hypermedia

Nielsen, J. (1990) show that hypermedia is an information system that allows navigation in documents linked together by hypertext links, as well as research, collaboration and content creation. Hypermedia offers a non-linear approach to information, allowing users to navigate through different paths and follow their own interests and paces. It also promotes collaboration between users by allowing the creation of shared documents and access to common resources. Finally, hypermedia allows the creation of new documents by combining existing elements to create original content.[8], its functions are numerous and can be grouped into: navigation, research, collaboration and creation.

Navigation is the most obvious function of hypermedia. It allows the learner to easily navigate between the different documents and quickly find the information they are looking for. With advanced search tools, learners can quickly find the information they're looking for, whether it's web pages, PDF documents, or other file types. Search tools also allow you to filter results based on specific criteria, such as date, file type, or content, [9]. Collaboration is an increasingly common feature in hypermedia information systems. It allows several learners to work on the same document at the same time, share comments and collaborate on the creation of new content. Collaboration tools can include features such as document sharing, real-time chat, and real-time co-editing.[10]

Finally, creation is an essential function of hypermedia. Authoring tools allow users to create new documents, edit them, and publish them online. Authoring tools can include text editors, graphic design tools, and web development tools.

2.2 The architecture of adaptive systems

An adaptive hypermedia system contains three models of the domain, learner and adaptation, whose architecture is composed as shown in Figure 1

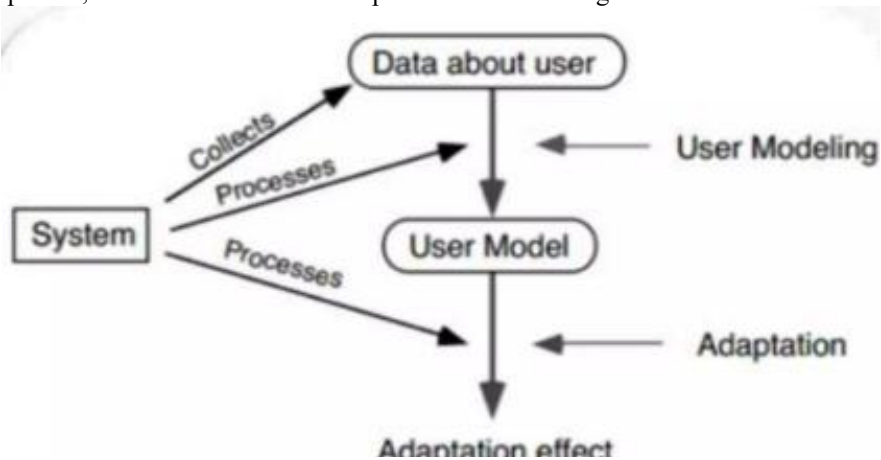


Figure 2 : adaptation de la modélisation utilisateur en boucle classique dans un système adaptatif.[11]

The essential feature of adaptive hypermedia systems is the ability to provide hypermedia adaptation based on the learner model as shown in figure 1, therefore it is centered on the adaptation problem in the first place, the part of the process is the adaptation of the system.

2.3 Adaptive hypermedia methods and techniques

According to Karampiperis, P., & Sampson, D. (2004). Adaptive hypermedia is an approach that consists in personalizing the learner experience by adapting the interface and content of a hypermedia information system according to the needs, preferences and context of the learner. They also highlight several methods and techniques that can be used to implement adaptive hypermedia, such as learner modeling, content recommendation, and interface personalization, [12]. For this, several methods and techniques can be used:

Learner Modeling: This involves creating a learner model based on their preferences, knowledge, and skills. This model makes it possible to better understand the needs of the user and to customize the interface accordingly,[13].

Domain modeling: this involves creating a model of the application domain of the information system, based on knowledge and business rules. This model makes it possible to better understand the content of the system and to personalize it according to the needs of the learner.[14]

Context analysis: this involves analyzing the context in which the learner uses the information system, based on information such as place, time, device used, etc. This analysis makes it possible to best adapt the interface and the content according to the needs of the learner in the given context.

Recommendation: This involves recommending content and features based on the learner's needs, based on their browsing history and pattern. This technique guides the learner to the most relevant content for him.

Customization: This involves customizing the interface to the learner's preferences, allowing them to choose colors, fonts, layout, etc. This personalization can be based on a questionnaire previously completed by the learner.[15]

Real-time adaptation: this involves modifying the interface and the content in real time according to the actions of the learner. This technique makes it possible to offer additional options or reorganize the content to better meet the needs of the learner.[16]

3 Practical side

There are many hypermedia systems in education, each with its own characteristics and advantages. Here is a ranking of some of the most important hypermedia systems used in education, based on their popularity and relevance to different types of learning:

Moodle: Moodle is an open-source learning management system for creating interactive online courses. It is very popular worldwide and is used by schools, universities and companies. Moodle offers features such as content creation, user and group management, online communication, assessment and progress monitoring[17].

Canvas: Canvas is a learning management system that provides a simple and intuitive interface for students and teachers. It allows for online course creation, user and group management, online communication, assessment and progress tracking.

Blackboard: Blackboard is a learning management system used in many schools, universities and companies. It offers features such as content creation, user and group management, online communication, assessment and progress monitoring.[19]

Edmodo: Edmodo is a learning management system used in many schools, universities and companies.

Edmodo: Edmodo is an online learning platform that allows teachers to create online courses and communicate with students. It offers features such as content creation, user and group management, online communication and assessment. [20]

OpenEdX: OpenEdX is an open-source e-learning platform for creating interactive online courses. It offers features such as content creation, user and group management, online communication, assessment and progress monitoring.[21]

H5P: H5P is an interactive content creation tool for online courses. It allows you to create quizzes, interactive videos, interactive presentations, drag-and-drop activities and many other types of interactive content.[22]

Adobe Captivate: Adobe Captivate is an interactive content creation tool that allows you to create interactive online courses with simulations, quizzes, videos and scenario-based interactions.[23]

These are some of the most popular hypermedia systems used in education, but there are many others. The choice of a system will depend on the needs of the teacher or learner, the type of content to be created and the functionality required.

Conclusion

Hypermedia systems in education are educational tools that have evolved to meet the learning needs of learners. They offer many features, such as customization, real-time adaptation, domain modeling, and adaptation of classic loop learner modeling. These features allow learners to navigate multimedia documents and appropriate content according to their pace and needs.

Among the most important hypermedia systems in education are Moodle, Sakai, Caroline, LON-CAPA and TACTIC. Each of these systems has its own unique features and functionality, but they all share the common goal of enhancing learning by providing an adaptive and interactive learning experience.

Hypermedia systems in education have great potential to improve learning efficiency and learner experience by providing adaptive and interactive features. Future technological advances could further improve these systems by allowing finer adaptation according to the context and the cognitive profile of the learner.

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