A Survey of Applying User Profile in the Adaptive Instructional Systems

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Abstract: Now, teaching technology with the using IT equipments has expressed its energy to improve teaching and learning in traditional learning form. In this context, computer usually becomes a powerful medium in education to support learners for searching information, doing self-study, sharing materials, communicating with friends and so on. It is more and more familiar and cannot miss it to all learners at all ages, and instructional systems have been also developed to meet all learning demands of everybody when working with the computer.

Recently, personalized systems, called adaptive systems, have been developed in many fields such as e-Commerce, Information Retrieval and e-Learning. In these systems, every user possesses a component of user profile. It depends on applying field that contains different information to describe him or her as personal identification, preferences, and habits. From that the system usually provides user services or information appropriate for his/her profile. Therefore, using profile in instructional systems will help them provide learning resources or recommendations which are suitable for learner's ability and knowledge backgrounds; also, many studies have built such adaptive systems. In addition, e-Learning has being developed widely all over the world from the developed countries to the area of the developing countries. E-Learning through using in real-life has shown not only many advantages but also some disadvantages as direct interactions between instructor and learners, learning activities, especially in self-study. The tendency of building an adaptive e-Learning system is also a way of approach to improve the limitations in this form.

Our article is a detailed investigation into the application of user profile in Adaptive Instructional Systems, which lays a foundation for the improving and developing of Adaptive e-Learning Systems and then develops them into blended-learning environment, a form of teaching and learning appropriate for undergraduate education context in such developing countries as Vietnam.

Keywords: Adaptive System/Personalized System, Intelligent Tutoring System, Adaptive Hypermedia System, e-Learning, User Profile

1. Introduction

Adaptive systems have recently been being applied widely in many fields such as Information Filtering, e-Commerce, Recommender system (Montaner 2003), and even e-Learning (Mödritscher et al. 2004). Within these systems, each learner is signified by a profile to present the character of a user – so called user profile, and the user profile of each system will store different kinds of information based on a particular application field – to describe thoroughly characteristics of the user, for example personal information, education, needs, hobbies, habits. Thanks to these pieces of information, the system can supply the user with suitable information, resources, and services.

In the context of teaching and learning with the assistance of computers – CBT (Computer-Based Training) hay CAI (Computer-Assisted Instruction), the implication of user profile will help the system provide learning resources or learning consultancy which is suitable for learner's ability and knowledge foundation; also, many researchers have built such Adaptive Training Systems.
Furthermore, e-Learning has been popular all over the world, from developed countries such as the United States, Northern Europe countries and Australia to developing countries (in Asia). Through applications in reality, this form of training has proved its advantages in terms of learning contents, learning time and learning environment as well as its disadvantages in terms of face-to-face interactions between instructor and learner in learning activities, especially in learner self-paces (Morgan 2003) (Arabasz et al. 2003) (Allen and Seaman 2009). The aim at building an Adaptive e-Learning System – in short AeLS - is also a way to deal with the drawbacks of the e-Learning form.

Our article is a detailed investigation of applying the user profile in the instructional systems, which lays a foundation for the improvement and the building of AeLS’s, and develops them into blended-learning environment, a form of learning appropriate for the teaching and learning context (higher-education context in particular) in developing countries as Vietnam.

In the next part of the article, we will present some study on user profile and its applications in various fields in section 2. Section 3 involves user profile and its problems. Section 4 deals with the developing user profile in online education as an AeLS and finally, section 5 is the conclusion.

2. User profile and its applications in various fields

2.1 Early applications in Information Retrieval/Information Filtering

Information Retrieval (abbr. IR) - i.e. Information Searching – is a field of IT which appeared as early as in the 1940s; its studying subject is the presentation, storage and processing of data, in which finding available information that meets a particular needs is of special interest (Salton and McGill 1983) (Manning et al. 2005). The goal of IR is to retrieve the information best related to a user's need. The process model of an IR system mainly involves comparison between enquiry and related data as in Figure 1.

![Image of PROCESS MODEL OF AN IR SYSTEM](image)

**Figure 1:** The process model of an Information Retrieval system.

However, the booming of information, especially on the internet, has led to information overload (for information resources are enormous and they are constantly modified), so the results of searching information according to a user's demand are easily overlapped or redundant, for the system is unable to distinguish what the user was interested in or in need of before with the context of searching at present or it provides the same answers for different users. That problem can be solved by filtering out information that has been known by users or become redundant and no longer necessary. That proves the limitations and difficulties of the system in personalizing searching results. This leads to a new technique, Information Filtering (abbr. IF), a developing step of IR based on a new concept - user profile.
User profile is personal characteristics and individual preferences of a user to represent her to found the basics for fundamental processing of IF system. User profile can be named user characteristic, user portray or user model. In teaching and learning context, user profile can be information that describes thinking capability, knowledge base, learning habits, learning targets, and so on. After assigned a value, these components are stored in the system (static or changing from time to time). Depending on the content and the amount of information about the user in user profile, the user can be signified by profile. Hence, a profile can be regarded as the user model which the system keeps for updating and exploiting (Koch 2000). According to many reference materials, the terms user profile and user model are synonyms; or any of the two can be used with two meanings (i.e. personal characteristics and personal characteristic model. Figure 2 shows the process model of an IF system, mainly through comparison between user profile of a user with data.

Figure 2: The process model of an Information Filtering system.

Figure 1 and Figure 2 display two models help recognize the differences in processing functions of the IR and IF system, in which the basic difference between these systems is the use of user profile for processing choice.

Recommender System (abbr. RS) is early application of IF model. It is the development of personalization softwares, which presents the adaptation to personal requirements, preferences, and desires of each user. The application field is mainly e-commerce systems such as Amazon (http://www.amazon.com), Levi's (http://www.levisstore.com/home/index.jsp), eBay (http://www.ebay.co.uk), Reel.com's Movie Matches (http://www.reel.com), CDNow (http://www.cdnow.com), and so on (Ben Schafer et al. 1999).

2.2 Applying in Intelligent Tutoring System and Adaptive Hypermedia System

Personalized system in the context of IT and the term “personalization” are understood as content satisfaction or imaginary personal preferences the system draws to supply information, resources, and services appropriately for users. As a result, this term is considered the representative for the term “adaptive”, and “personalized system” can be called “adaptive system” for short. There are two main features of an adaptive system. Firstly, with regard to the huge amount of information at present, the system needs collecting and distributing only information relevant to an individual person or group. Secondly, it is the application of the concept “one to one marketing” in the way businessmen do marketing to satisfy the demands of an individual group of customers with the purpose of increasing sales. As for customers, they can enjoy benefits from getting useful advice/consultancy and purchasing the best favorite goods or services in right time (Kim 2002).

An adaptive system is well adjusted itself or other systems in various circumstances. The process of adaptation depends on user’s goals and preferences. These characteristics are stored in user profile usually called in form user model, then system manages it and provides information about the user.
when necessary (Brooks et al. 2006). A user model enables distinguishing different users and provides the system with information so as to respond according to user profile. Usually, the general structure of a system is shown as in Figure 3.

Generally, the adaptive process is divided into three phrases:

- Searching for information that is relevant users
- Processing information to set up and update user model
- Taking advantage of user model for exploitation adaptation supply

Figure 3: The generic architecture of an adaptive system.

One of adaptive systems that deserve our consideration is Intelligent Tutoring System (abbr. ITS). ITS is a form of adaptive instructional system using artificial intelligence. The goal of ITS is to provide benefits from “one to one instruction” automatically and economically. Like other training systems, ITS consists of components presenting learning contents, instructing and tutoring strategies, as well as techniques that are able to identify what learners have known and have not known yet. Hence, these components are arranged into sub-systems such as expertise module, student-modeling module, tutoring module and user interface module. ITS applies micro-adaptive model because the decisions on learning diagnosis (what learners want to learn) and learning scripts (how the system teaches to meet learner’s demand) are made through the process of operating and enforcing system’s functions.

Next is the development of Adaptive Hypermedia System – AHS recorded as early as at the beginning of the 1990-ies. AHSs use hypermedia model, an expanding model of user model. AHS derives from ITS and aim at the combination between adaptive learning systems and hypermedia-based systems. So, an AHS satisfies three following requirements; first, the system’s domain knowledge built basing on hypertext or hypermedia (including graphics, audio, video, plain text or hyperlinks); second, the use and exploitation of user model; third, the system’s capability of exploiting domain knowledge adaptively through taking advantage of user model. AHS is often used in educational systems, e-commerce applications, information systems and help systems (Brusilovsky 1996).

AHS is usually separated into two types based on adaptive methods (Brusilovsky 2001). The first category concerns adaptive presentation, which means providing adaptation in terms of contents, for example, presenting contents in different ways or different orders. The contents can satisfy users by changing details, levels of difficulty and usage based on user profile (e.g. need, background knowledge, perceptive characteristics). The second category concerns adaptive navigation support through forms such as direct guidance, hiding or reordering of links, links annotation, or map adaptation.

In the area of e-learning, AHS is capable of providing studying materials for learners according to their interests; and learners can make sure that learning contents presented are relevant to the topic of concern and comprehensible to learners.
A sub-form of AHS is Adaptive Educational Hypermedia System (abbr. AEHS); with this name, the system is used within educational and training contexts. As data related to a separate topic, domain knowledge of AEHS is a small storage and is called document spaced. For this system, the concern of user model is to exploit adaptively domain knowledge of learner (Brusilovsky 1996).

An AEHS consists of a document space, a user model, observations and an adaptation component. Document space relies on hypermedia-based system and is enriched by additional information (captions, knowledge graphs). User model stores and describes user’s personal information, background knowledge and preferences. Observations demonstrate information about interaction between users and AEHS; this component is used for updating information for user model. Finally, adaptive rules, for example, a content/topic suggested to be learned or an order of a learning content/topic recommended to be followed; and adaptive treatment, for example, the arrangement of links to supplementary data depending on learners’ needs, are to be provided by adaption component (Henze and Nejdl 2003).

At the moment, Adaptive and Intelligent Web-Based Educational System (abbr. AIWBES) are bringing about big changes traditional approach “just put it on the Web” of web applications by developing web-based educational courseware. AIWBES has been attempting to be more adaptable by building user models of individual’s goals, preferences, and knowledge and then using this model for adapting itself to user’s requirements through interaction with the user. These systems has been trying to be more intelligent by closely associating and handling of some traditional learning activities by real instructors such as direct assistance and prediction of concepts “forgotten” by learners to remind them and help them appropriately.

Generally, adaptive instructional systems can be categorized into five groups based on their models and technologies (see Figure 4): adaptive hypermedia, adaptive information filtering, intelligent monitoring, intelligent collaborative learning and intelligent tutoring (Brusilovsky and Peylo 2003).

Figure 4: Five groups of modern AIWBES’ technology.

(*) CSCL- Computer-supported Collaborative Learning

However, such adaptive and intelligent learning systems still have some typical limitations in the following list: (Brusilovsky and Maybury 2002) (Schroeder and Spanagel 2006) (Madhour and Wentland Forte 2006) (Brusilovsky et al. 2007)
- Learning contents are restricted within the boundaries of a subject/course;
- Learning contents are handled manually, are labor-consuming and have to follow a suggested framework;
- The order of presenting learning contents is designed explicitly fixed by the instructor in advance. (Individual learners cannot add some contents/topics to the suggested learning script or delete some from the script);
- Thorough and accurate feedbacks are required;
The integration of the system’s components is fixed;
- There are no interaction learners and learning resources. (Learners do not know why the system provides a particular content or requires them to acquire particular knowledge).

Table 1: Major Artificial Intelligence in Education Paradigms Compared (Brusilovsky and Peylo 2003)

<table>
<thead>
<tr>
<th>Types</th>
<th>AI-CAT(^{(2)}) paradigm</th>
<th>ITS(^{(2)}) paradigm</th>
<th>AIW(^{(2)})ES(^{(2)}) paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>Replace primitive CAT in transferring knowledge</td>
<td>Support problem solving</td>
<td>Comprehensive support</td>
</tr>
<tr>
<td>Context</td>
<td>Classroom without teachers</td>
<td>Classroom with a facilitator or self-study</td>
<td>Self-study</td>
</tr>
<tr>
<td>Learning Materials</td>
<td>All learning material inside the system, most often presentations, but also exercises and problems</td>
<td>No presentation material inside the system, but problems are often included</td>
<td>Rich learning material on-line: presentations, examples, problems</td>
</tr>
<tr>
<td>Technologies</td>
<td>Curriculum sequencing and intelligent solution analysis are the core technologies</td>
<td>No course sequencing or adaptive hypermedia. Interactive problem solving supports the core technology in the system.</td>
<td>Extensive use of adaptive hypermedia. Curriculum sequencing and intelligent solution analysis become widespread again. A range of Web-inspired technologies appears</td>
</tr>
<tr>
<td>Completeness</td>
<td>All systems focus on single intelligent technology</td>
<td>Most systems focus on single intelligent technology</td>
<td>Most systems focus on several intelligent technologies</td>
</tr>
<tr>
<td>Platform</td>
<td>Mainframes and mini-computers</td>
<td>PC</td>
<td>WWW</td>
</tr>
</tbody>
</table>

\(^{(2)}\) Adaptive Intelligent - Computer-Assisted Instruction (AI-CAT),\(^{(2)}\) Intelligent Tutoring System (ITS),\(^{(2)}\) Adaptive Intelligent Web-Based Educational System (AIW\(^{(2)}\)ES)

3. User profile and related problems
As presented so far, the adaptive treatment process is divided into three phrases: collecting information describing users and displaying that in profile; setting up and updating user profile; and finally exploiting user profile. Then, a general adaptive system using profile is concerned with the following problems: (1) describing, (2) representing, (3) initiating, (4) updating and (5) exploiting user profile. Within our article, we will focus on (1); for dealing with this matter depends on the application field and from that we can describe the user correctly. If one profile represents a user accurately and it is appropriate for required applications, then we are able to build up an effective adaptive system that is only used conventional methods to solve the problems (2), (3), (4), and (5).

3.1 Describing profile
Until now, many representations of user profile used for adaptive systems have been studied and developed. In our article, we will present a few models displaying user profile which are used in Digital Libraries, Recommender Systems and AEHS/e-Learning.

Amato and Straccia (1999) suggest a model to describe user profile in the field of digital library as follows:

\[
UserProfile = (PersData \times GathData \times DeliData \times ActData \times SecData), \text{ in which}
\]

PersData is personal data category such as full name, date of birth, gender, occupation, address, etc. GathData is gathering data category including information about the strengths and limitations of the documents/data the user is searching for. DeliData is delivering data category, ways of delivering collected data (based on media and time). ActData is action data category, which stores notices about interaction between users with searching systems and information navigation. Lastly, SecData is security data category, which includes sets of favorite information of user characteristics in the profile that is set to be exploited.
Montainer (2003) shows a model of user profile for recommender systems as $\text{UserProfile} = (\text{ItemData} \times \text{InterestData})$. This model considers user profile as a case based on past experience about a particular topic/product. Cases are divided into 2 sets. Set 1 is descriptions of the topic/product and set 2 is descriptions of customer's interest in the topic/product.

For example, in the field of restaurant consultancy, headings/products and interest are displayed as follows:

$$A_i = \{\text{name, address, phone number, cuisine, approximate price, capacity, webpage}\}$$

$$\text{Int}^r = \{\text{quality/price relation, quantity of food, table-waiting efficiency}\}$$

$$\text{Int}^t = \{\text{webpage visits, recommended times, retrieved times}\}$$

Together with the development of AHS, Brusilovsky et al. (2007) recommends a user model applied in AESH which consists of 5 groups of information as follows:

$$\text{UserProfile} = (\text{Knowledge} \times \text{Interest} \times \text{Goals} \times \text{Background} \times \text{Individual trait}).$$

Knowledge is the data category about learner’s knowledge in a particular topic or research content. Interests are the data category about learner’s interest in the topic. Goals are the data category about essential goals for learners. Background is the data category containing relevant descriptions of previous experiences (knowledge/skills) with related objects (topic/subject). Lastly, individual traits is the data category presenting features of individual learners (learning style, thinking, learning attitude).

For example, AHA!, which Debra et al. proposed in 2003, is an AHS built based on user profile by Brusilovsky with the components of knowledge, interests, goals and learning style, displayed in form of attributes of a concept and from that presented differently to different users.

Le et al. (2009) propose a learner profile for a general e-learning system, which consists of 4 main data categories:

$$\text{UserProfile} = (\text{Demographics} \times \text{Training experiences} \times \text{Self-study activities} \times \text{Learning demands}).$$

Demographics are the data category about an individual learner and her family profile. Training experiences represent data about background knowledge, previous knowledge in the topic/learning contents. Self-study activities are the data category about self-study habits, learning targets, and learner's characteristics. Learning demands are the data category about learning motivations, learning preferences and interests in the topic/learning content.

For instance, in the field of e-learning for college students, learner profile is described as follows:

$$P_d = \{\text{age, gender, address, marriage status, current job, working place, training course}\}$$

$$P_t = \{\text{high school classification grade, current training result, known knowledge, subject knowledge}\}$$

$$P_s = \{\text{self-study freq, self-study time, self-study period, personality traits, cognitive capacity}\}$$

$$P_l = \{\text{learning attitude, liked subject, disliked subject, participated level in learning activity}\}$$

3.2 Representing profile

Profile is generally presented in the following models:

- **History-based model**
  - Profile = documents, Web pages, books read/bought (+ feedback).
  - Application: e-commerce (e.g. Amazon).

- **Vector space model**
  - Profile = list of features (words, concepts).

- **Weighted n-grams**
  - Profile = graph: node = n-words; arc = 2 nodes stored similar words.
  - Application: document recommender.

- **Weighted semantic networks**
• Profile = graph: node = concept; arc = semantic relation (e.g. synonym, generalization).
• Application: document recommender.

- Classifier-based models
  • Profile = classifier (based on learning machine technique; utilizes training sets such as neural network, decision tree, association rules, Bayesian network)
  • Application: e-commerce, document recommender, anti-spam.

In addition, there are such models as user-item ratings matrix (historical user ratings of items; does not utilize training sets), demographic features (stereotype).

3.3 Initiating profile
This is a difficult problem met when designing the system because users do not mind to spend time declaring their preferences or establishing user profile at first. Including:
  - Empty profile - though identifying user's interactions (using history-based model).
  - Manual - users are requested to give a list of topics of their interest and register in the system. This can lead to problems for users; at the same time, the system may receive more inaccurate or inadequate information than expected.
  - Stereotyping - the system sets a few model profiles. From some simple beginning information (e.g. name, age, gender, address, occupation), the system will assign one among a few profiles which – according to the system - seem most appropriate.
  - Training set - users are required to look through some examples or model profiles and suggest their own preferences.

3.4 Updating profile
Setting up profile at the beginning is generally applied to a new user of the system. However the information in the first profiles is rather simple and they cannot reflect accurately all characteristics of individual users. Consequently, updating profile is essential for adaptive systems. Updating profile undergoes two periods: receiving feedback and updating profile.

Techniques of collecting relevant feedback
These are ways in which the system receives information in order to update profile. There are two main approaches toward the problems of gathering feedback from users: explicit feedback and implicit feedback. Many systems combine both approaches for updating profile. The most typical way is to base on positive information (items that are chosen or bought) or negative information (items that are not chosen or are purchased but not favored) in the following techniques:
  - No feedback - the system does not automatically update profile, so it recommends that users update their profile manually.
  - Explicit feedback – the system requires users point out their likes and dislikes, participating in ratings, or provide feedback in form of text.
    Strength: system design is simple.
    Weakness: users involuntarily and unwillingly give feedback when requested.
  - Implicit feedback – the system withdraws descriptive information through supervising customer's activities including webpage history, purchases in the past, navigation-choice in the past, working time on webs, and processing activities such as saving/printing/deleting a document, bookmarking, the acts of scrolling/maximizing/resizing a window.
  - Hybrid approach – a combination of explicit and implicit feedback. For example, Amazon use hybrid approach, in which the explicit feedback technique of ratings and implicit feedback technique of purchase history.

Methods of profile adaptation include:
  - Manual - users are requested to update their lists of preferences.
  - Adding new information step by step - the most popular way, in which data are added according to relevant feedback (the restriction is that the system cannot get rid of outdated interests).
  - Adding new information and at the same time gradually forgetting old information - relevant feedback in more recent time will be marked as more positive, and interactions in more


distant time will be forgotten. Or a time window slipping on data is used (use heuristics to measure the size of time window).

3.5 Exploiting profile in adaptive systems

To provide suitable resources and services for individual characteristics and user’s requirements, adaptive systems depend on information in profile together with information about exploited resources, mainly by the technique of comparing the characteristics of the resources and user profile. Currently, there are three methods dealing with selecting appropriate resources for users: content-based filtering, collaborative filtering, and hybrid filtering. These methods usually use the techniques of nearest neighbor, clustering, classification or statistics.

4. Developing user profile in online education as an Adaptive e-Learning System

The U.S. Department of Education analyzed research studies undertaken from 1996 to 2008 that address to college/university-level learning and has concluded that “online education is more effective than face-to-face learning, and online learning combined with some face-to-face learning (blended/hybrid learning) is the most effective” (Means et al. 2009). Accordingly, a problem is found that “how to build the blended-learning environment appropriately with educational contexts of a developing country”.

In the teaching and learning contexts of developing countries' undergraduate education now such as Vietnam, there are many disadvantages like as ineffective teaching methods, inadequate resources, lack of common or professional skills (team work, communication), lack the time necessary for teaching preparation, weak capacity of network and infrastructures. Stephen et al (2006) in observations on undergraduate education at select universities in Vietnam led to the conclusion that there are five critical areas of Vietnam higher education in need of change: undergraduate teaching and learning (e.g. ineffective teaching methods, inadequate facilities and resources); undergraduate curriculum and courses (e.g. many courses with over 200 credits to graduate, out-of-date content of individual courses and the overall curriculum); instructors (e.g. lack of qualified instructors, skills of faculty in modern teaching, and up-to-date knowledge by faculty with regard to curriculum and course content); graduate education and research (e.g. little opportunity for PhD instructors’ research, separation of research institutes and laboratories from teaching departments); and assessment of student learning outcomes and institutional effectiveness (e.g. lack of clearly articulated and coordinated student learning outcomes at the institutional, departmental, program, and course levels). Moreover, in 2005, Vietnamese government adopted the policy statement Resolution 14 on the “comprehensive renovation of higher education” by 2020 (Vallely and Wilkinson 2008). Hence, the blended-learning form can be good approach for using on-line learning combined with traditional learning (i.e. face-to-face) to support for instructor and learners in this context. To instructor, he1 can improve his teaching activities with the supports of computer and Internet. To learner, she can get more benefits from her learning activities such as adding an information channel of lectures and materials and a new learning environment; improving self-paced activities and learning motivations; and strengthening collaborative learning skills: teamwork, debate, discuss, sharing ideas.

Besides, the challenge for instructors and course developers working in an online learning context is to construct a learning environment that is simultaneously learning centered, content centered, community centered, and assessment centered. There is no single, right medium of online learning, and nor a formulaic specification that dictates the kind of interaction most conducive to learning in all domains with all learners (Anderson and Elloumi 2008). Then, the future e-Learning system will be an Adaptive e-Learning System that is integrated strongly with pedagogy of instructors and context of learners (see Figure 5).

From the related works above and pedagogical analyses, we cared about some problems to solve such as:

- There is a need for greater diversity in profile’s information to support the learning activities in the e-Learning systems, especially self-study and in-group activities. These activities focus on reinforcing the interactions in system and almost similar to learning activities in the traditional classrooms.
- The initiating problem and evolution of profile in run-time process.

1 The feminine form is used in this paper for learners and the masculine form for instructors.
So, we proposed a generic structure of learner profile for e-Learning system (Le et al. 2009) and a pedagogical model for blended-learning of Vietnam’s higher education context (see in Figure 6).

Figure 6: The pedagogical model for blended-learning environment of Vietnam’s context

In Figure 6, Web-based course is an important computer-mediated technology and infrastructures. It consists of two parts: content knowledge and learning activities. Learner can be interactive actively with instructor or other learners in different activity's styles, system will play a role of virtual tutor or virtual learner to participate these activities simultaneously, and all of them base on Student model and Tutor model. The Student model stores information that is specific to each individual learner, it consists of learning mode, learner profile and learning history. Since the purpose of the Student model is to provide private data of each learner/group for the system, all of the gathered information
about learner/group should be able to be used by the system. The Tutor model (or Expert model) is a model of how someone skilled in a particular domain represents the knowledge (i.e. one that is capable of solving problems in the domain). By using a Tutor model, system can compare the student's solution to the tutor's solution, pinpointing the places where the learner had difficulties (role as a virtual tutor).

5. Conclusion
To sum up, profile is a vital and indispensable component in adaptive systems; it is a foundation for distinguishing the different users within system and comparing characteristics of the system's resources and services with user's characteristics to provide the most something suitably for user. One person is regarded as good profile only when it reflects correctly features of his/her individual within the specific adaptive system. The article presented an investigation into profile and its applications in adaptive instructional systems, which aim at laying a foundation to approach our previous study and development of AeLS discussed in earlier reports. In the near future, we are continuing our search to complete the model of AeLS and experiment specific settings in teaching and learning at select universities in Vietnam (such as HCMc University of Pedagogy, HCMc University of Science).

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