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Towards a new ontology of the Moroccan Post-baccalaureate learner profile for the E-orientation system "MMSyOrientation"

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Abstract: *Today E-orientation systems are interested in helping learners to choose a suitable branch to their skills and preferences. In this context the research center within the University Hassan II Mohammedia Ain-Chock announced the appearance of MMSyOrientation project. This project focuses on the orientation of Moroccan student's education as a concern and a family, social, and political preoccupation. The student remains an educational system focus center, especially at the MMSyOrientation[i] project level, which requires suggesting a feasible model for this major actor. Thus we should refer to users' models specifically learners' profiles, which deal with these outlines in the EIAH domain (it environments for human learning). These models are generic and not dedicated to the academic E-Orientation systems. The purpose of this article is to propose a direction model to the student on the most appropriate way of their profile. In this context we could implement an ontology entitled (Onto E-orientation) to an E-orientation Moroccan system representing different ways of information on such learning, using OWL language.*

Keywords: *E-Orientation, MMSyOrientation, EIAH, User model, learner profile, Ontology.*

I. Introduction

For a long time, the orientation system has been interested in helping people to make their choice. This is done by using counselors' guidance who knows as many details about the teaching field to help students to choose a right way in terms of career.

With the advent of information technology and communication for teaching (TICE), the actors in this area thought to adapt this concept to the current time, implementing a new concept called E-orientation, which is interested in automating the orientation task thanks to Information Technology (IT). While liberating the counselors so that they will be interested in other complicated tasks requiring human intervention. However, the realization of an E-Orientation system has exposed several constraints and problems. On the one hand the modeling of a student profile (personal, psychic information, learning styles, etc ...) and on the other hand the adaptation of the profile to one or more suitable choices.

According to our humble knowledge, representation models of the existing learner profile are generic and are not dedicated for academic E-Orientation systems.

This paper presents a new model that is specific to Moroccan academic E-Orientation systems, and overcoming the limitations cited above.

Currently ontology constitute an innovative solution for the representation of shared knowledge [1].

The proposed model is ontological, implemented and ready for later use in the E-Orientation system which is the MMSyOrientation Hassan II University project between Laboratory of Computer Mohammedia (LIM), Information Technology and Modeling Laboratory (LTIM), Laboratory for Analysis Modeling and Simulation (LAMS), and Department of Mathematics Cryptography and Mechanical (LMCM).

In this article, we define the modeling issues of the learner's profile in chapter 2, our contribution in the domain will be presented in Chapter 3, the implementation of the ontology is described in Chapter 4, and Chapter 5 is the latest to close and define our perspectives.

II. The learner's profile modeling

There are several representations of the learner's Profile models [2]. The rest of this section provides a global vision on the various most pertinent models in the literature.

1. AHAM

AHAM [3] is a very general model used to describe the adaptive hypermedia systems (SHA) for teaching, online help, System Information (SI) online, etc… This model divides the SHA in three layers which are interconnected between them:

- The model storage layer is a set of nodes and links. This layer is organized into three components which are the domain model, the learner's model, and the adaptation model.
  - The domain model shows the hypermedia application area as seen by the authors
  - The user model contains pertinent information on the user utilized for adaptation.
  - The adaptation model collects rules that are used for adapting hypermedia by combining the information on the domain model and the user model.
- The "content components" layer specifies the content and structure of the nodes. The adaptation of the hypermedia is performed by the adaptation engine forming part of the "Specification of presentation" interface.
- The execution layer.

2. Munich

The Munich model [3] is a very general model that is not only used for educational SHA but also for other types of SHA [3]. This model was developed independently of the AHAM model. The major supply of this model is that it uses a graphical language for describing the various components of a SHA. The layered architecture has been replaced by a UML package diagram and description of the user model, domain and adaptation was illustrated by UML class diagrams. These diagrams are also used to describe the various features that are offered by the three models.

3. ALEM

This model is called ALEM (Adaptive Learning Environment Model) [4] and is an extension of the Munich model. This model contains the same three existing layers in the Munich model; it extends their functionality for better modeling of educational systems and includes an additional layer that is educational layer.

The different layers of ALEM model are:

- The component content layer: contains the content and structure of hypermedia nodes and it also serves to isolate the other layers specific details to the media;
- The storage layer: stores information about the structure of the hypermedia. This layer is composed of three meta models:
  - Meta domain model describing the scope of hypermedia;
  - The meta learner model describing the characteristics of useful learning for customization of hyperspace;
  - The meta model describing the adaptation strategies and adaptation rules.
- The educational film is an abstract representation of the course. This layer contains the course of the structuring model;
- The execution layer is the description of how the presentation of nodes. This layer is responsible for interacting with the learner, the acquisition of learner data and session management.

4. INT

The user model INT [5] is a triplet: <learner, preference, knowledge>:

- Learner is the ID of the user.
- The user preferences match to their language or their favorite presentation. Each element of the set of preferences is represented by a pair <attribute, value>.
- The user's knowledge is represented by triples of the form: <domainConcept, role, educationalState>.

5. Comparison between models

The Munich and AHAM models are very similar. Munich and ALEM model the SHA from the viewpoint of the approach "object-oriented". However, AHAM models the SHA from the perspective of the "database" approach.

All of these reference models represent the personal and educational information of the learner generically. Whereas, these models are not dedicated to the education system especially the E-Orientation systems. On the one hand there are many limitations in the psychic and stylistic modeling of the student profile, and on the other hand the adaptation of profile to one or more appropriate choices.

It is in this context that we will propose in the next chapter a new specific model for E-orientation systems specifically MMSyOrientation system.

III. The ontology of the Moroccan Post-baccalaureate student profile for the E-guidance system MMSyOrientation

In this section, we will describe the evolution of our former ontology orientation into two sub-components:

1. Former Onto

Our former ontology [6] is described as follows:

- Guidance is a set of branch (component).
- A branch can be either a coaching or mentoring, or either a portfolio or an ePortfolio.
- A coaching can be either a process or a technic, a guide, a video, or an exercise ...
- Tutoring can be a course, exercise, control, test, ...
- A portfolio is a document, a folder, a file, an archive, a collection of the work, a personal paper, a reference letters, certificates, report cards, photocopies in which learning outcomes and achievements of the experience of a person are defined and demonstrated based on skills, knowledge, attitudes and behaviors.
- An ePortfolio is an ebook, a picture, a video, a database, etc…

The orientation can be done either by coaching, tutoring, portfolio or ePortfolio.

- Coaching has a process or more, using at least one technic, provides a guide or more, is used as support video.
- Tutoring owns courses, uses exercises, contains controls, supports testing.
- The portfolio has documents, uses archives, contains folders, supports files.
- The ePortfolio has ebooks, uses databases, contains images, supports videos.

We found out that our former ontology has limitations which reside in:

- Orientation was considered as a concept, and not as a domain.
- The learner's model was not processed to generate a knowledge model.

2. Towards a new pedagogical orientation ontology for the system « onto E-orientation »

The domain ontology orientation system E-orientation (Onto E-orientation) is based on an ex-Ontology [6] we have developed. The latter is limited vis-a-vis the domain.

We specified the need of the orientation domain as follows:

- Knowledge area: academic and career orientation
- Objective: Using Onto E-orientation in the context of meeting the needs of MMSyOrientation project for remote position or orientation of electronic E-orientation to facilitate the Moroccan educational orientation task.
- Users: Learners, post-baccalaureate, trainers, parents, counselors,etc…
- Sources of information: All documents that are interested in the field of university and career orientation.
- Scope of ontology: Testing, presentations, courses, videos, etc…

The new ontology enriches both concepts that will be treated in the following section.

2.1 Learner's Profile:

The new ontology (Onto E-orientation) details the concept of learner's profile that is among the main elements for the proper practice of educational orientation field. The learner's profile is a specialization of templates that users must be well modeled. [7]

This concept has not been well analyzed in our former ontology to provide E-orientation systems, guidance or adequate recommendation to the required profile.

Several studies have provided solutions based on ontologies to describe user profiles, among them dealing specifically with the presentation styles (learning preferences) .The model [8] proposes an ontology of the learning profile with different characteristics one user, basic concepts, as concepts and relationships between various concepts. It describes a learner in 4 aspects as abstract concepts in the ontology:

According to Zayani [9] and Behaz [8] we have enriched our former ontology and precisely the learner profile model

We use a user model that describes the structure of each learner's profile. The latter has two types of characters [10], [11]:

- The permanent characteristics remain fixed in time. These features are provided by the user's (questionnaire or form) and introduce the user identity, demographics data etc…
- The evolutionary characteristics change over time. Generally, these features are not used and updated by observing the behavior of the user.

Moreover, [13] considers a user's profile is composed by:

- A set of permanent features' CharacPermanent '.
- A set of evolutionary characteristics 'CharacEvolutif' 'that may have one or more items' 'Item'. Each item can integrate identified user's needs in its applications and depend on another item.

2.2 Orientation :

Given the importance of the orientation process defined below, according to Guerss.F & Aitdaoud.M [6], we could deduce an adequate orientation process E-orientation system following its steps:

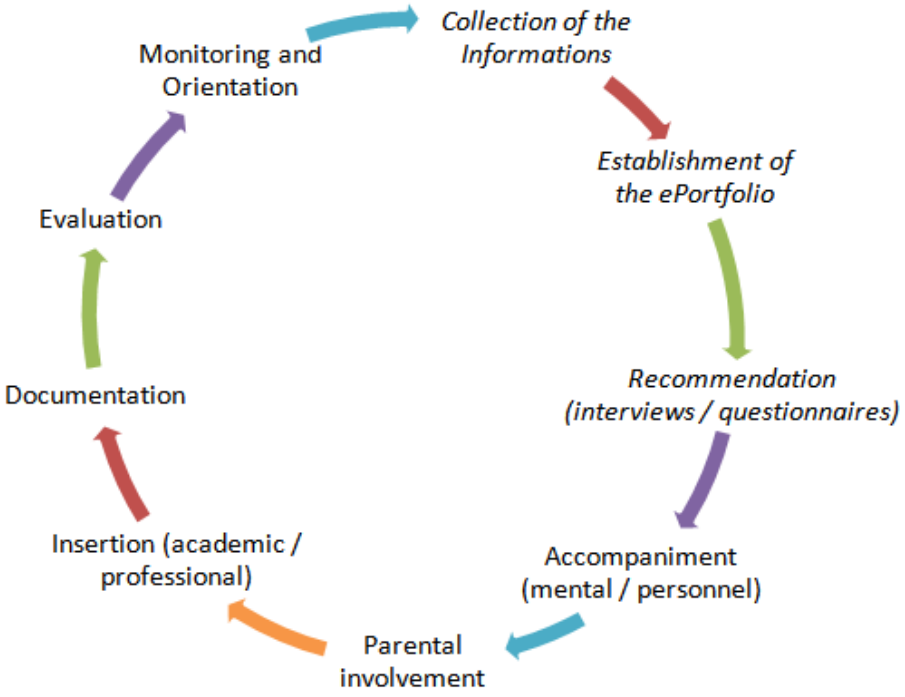

Figure 1: Process of orientation

These steps will try to give a motivation to the post-baccalaureate especially in the course selection.

In addition, we could extend the concept of orientation [6] to all actors that have an impact on it, dealing with the psychological, social and educational side in the pedagogical choice. The second part will detail this domain.

IV. Implementation

In this section, we will start by describing any of the glossary concepts and glossary orientation relations domain concepts and then by making the implementation of ontology 'Onto E-orientation "using the Protégé tool [12].

1. Glossary of the dictionnary concepts:

This part focuses on building of a dictionary of concepts. Each concept is assigned an identifier "iDConcept" which describes the properties that characterize it. The table below shows that.

Table 1: Glossary of the concepts

Name	Attributes	Relations	Synonyms
Person	Idperson	Has	Individual
Section	Idsection	Has	section or branch of study
counselor	Idcounselor	Has	psychological accompagnement
Parents	Idparents	Has	father, mother of the studiant
Profil	Idprofil	Has	cognitive characteristics of a student
Characevolutif	Idcharacevolutif	Has	evolving Characterics of a student
Capacity	Idcapacity	Has	acquistion Capacity of a student
Cptpedagogical	COD-requis	Has	Knowlege acquired from pedagogical learning
cptprofessionnal	COD_Cpt	Has	Knowlege acquired from professional learning
Diploma	COD_DIP	Obtain Result	Holder of a given level

		Included require taken in	
Domain	COD_domain	neccesitates	Sector
Level	Idlevel	Result	Degree ou value attained in a domain
Caracpermanant	Idcaracpermanant	Has	permanant charactèristics of a student
…			

2. Glossary of attributes dictionnary

The next task is the construction of the attribute chart which contains a precise description of the attributes of the concept dictionary, and the set of limits and constraints on these values. The table below shows an extract of the attribute chart.

Table 2 : glossary of attributes

Name	Type	Default Value
Idperson	Varchar2[10]	Idperson
Iddepartement	Varchar2[10]	Iddepartement
Idsection	Varchar2[10]	Idsection
Idcounselor	Varchar2[10]	idcounselor
Idparents	Varchar2[10]	Idparents
Idprofile	Varchar2[10]	Idprofile
Idcharacevolving	Varchar2[10]	Idcharacevolving
Idcapacity	Varchar2[10]	Idcapacity
COD-requis	Int	COD-requis
LIB_requis	Varchar2[60]	LIB_requis
COD_Cpt	Int	COD_Cpt
LIB_cmp	Varchar2[60]	LIB_cmp
COD_DIP	Varchar2[7]	COD_DIP
LIB_DIP	Varchar2[60]	LIB_DIP
LIB_DIP_ARB	Varchar2[60]	LIB_DIP_ARB
LIC_DIP	Varchar2[25]	LIC_DIP
LIC_DIP_ARB	Varchar2[25]	LIC_DIP_ARB
Sector_Disciplinary	Varchar2[20]	Sector_Disciplinary
…….	…….	……..

3. Glossairy of relations

The last task is the construction of the relationship table for each relationship we define the relation name, the main and targets concepts names and their cardinalities.
The table below shows an excerpt from the relationship table.

Table 3 : relations table

Relation name	Principal concept	Targeted concept	principal Card	Targeted Card
Sharing	Student	Hobby	1.1	0.*
Taken in	Diploma	Establissement	0.*	1.1
Require	Diploma	CptPedagogical	1.1	1.*
Included	Diploma	Nature_Diploma	1.1	1.1
Result	Diploma	Level	1.1	1.1
Obtain	Student	Diploma	1.1	0.*
Neccessitite	Domain	CptProfessionnel	1.1	1.*
Mastering	student	Language	1.1	0.*
Makes	Student	Training	1.1	0.*
…..				

4. Implementation of Onto E-orientation

The figure below shows our ontology (Onto E-orientation) implemented under the software Protégé 2000 v4.3.0.

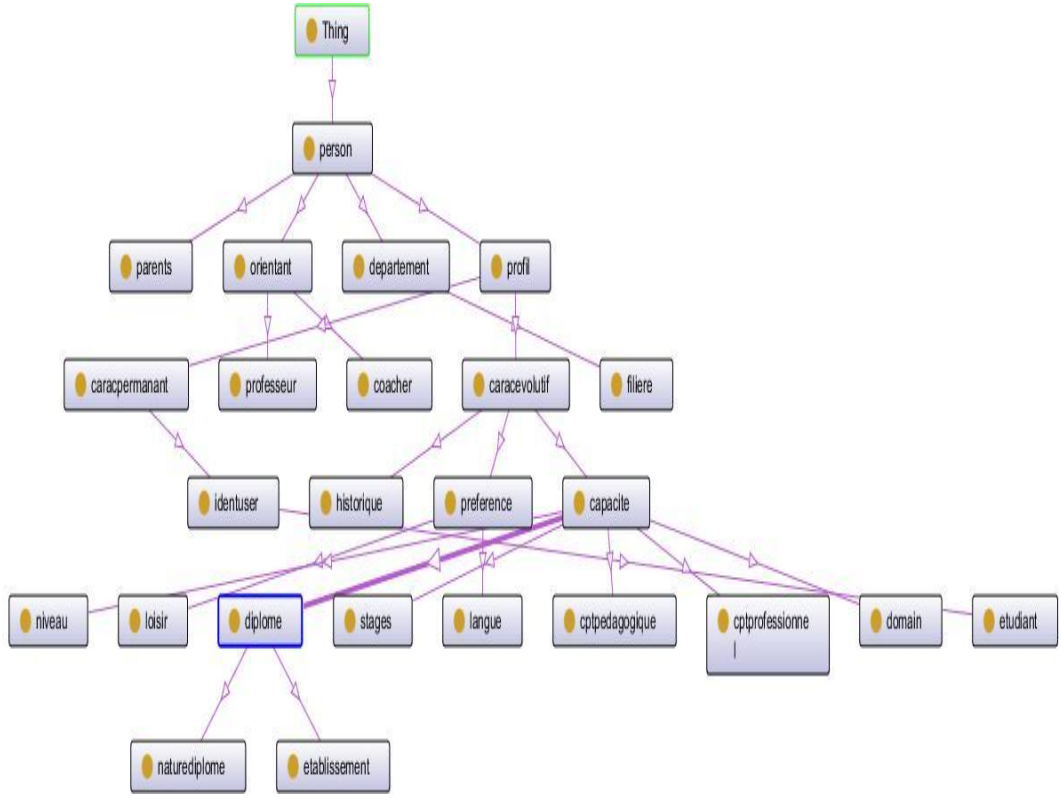

Figure 2 : orientation ontology domain (Onto E-orientation)

V. Conclusion and perceptives

In the project context MMSyOrientation, we proposed a new ontology of the Moroccan Post-baccalaureate learner's profile for an E-orientation system.

This ontology represents the learner in two permanent and evolving characters.

Our new ontology will be used in this system to orientate new students according to their educational, stylistic and psychological profiles.

We have to prepare a knowledge base combining such a profile to adequate section.

Then studying to ensure that the courses offered by our system are adequate according to the notes that will be obtained by students

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