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DESIGNING A MODEL OF ASSISTANCE BASED WEB SERVICES IN INTERACTIVE LEARNING ENVIRONMENT

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Abstract: *This work takes place in the framework of the realization of a pedagogical assistance system in the domain of technology enhanced learning (TEL) .In this context, we defend the thesis that it is possible to integrate an interface with a pedagogical agent in an ILE (interactive learning environment) based on web service, which aims to provide pedagogical assistance adapted to the learner. our approach is based on the analysis of the course of the learner , the system allows to represent , assist and analyze the evolution of a learning situation in order to detect the assistance status (blocking learner , non completing tasks…etc.) it is based on the comparison between the actions of the learning (traces) and action to perform (the domain model) the traces provide knowledge about the learning situation with one of the web 2.0 reporting techniques .our approach focuses on the representation of the evolution of learning situations and on adaptive pedagogical agent that offers several types of pedagogical assistance .*

Keywords*: pedagogical assistance, traces, reporting, web service, pedagogical agent.*

I. INTRODUCTION

In TEL arena, learning new knowledge or realizing an activity can require at one time or another complementary assistance, this assistance is more of a partnership between the learner and the environment as a direct guidance system. The main difficulty is then to design an automatic pedagogical assistance powerful enough to best meet the problems of learners. In this context, our aim is to design and implement a support system of individual learning that can improve the acceptability of the system and increase the use of effective assistance system for learners. Our approach is based on an accompaniment function through the integration of an ILE based on web service, and an interface with a pedagogical assistant agent with the role of pedagogical and technique accompanist. Offering this type of system poses different issues: the nature of interactions agent-learner, content interaction, content of proposals for pedagogical assistance ... etc. Research questions that we address in this framework include: the design and improvement of the behavior of assistant agents, focusing particularly on the re-processing of requests for assistance. Indeed, sometimes the learner does not receive a good explanation of the task, and cannot accomplish the task according to him in a learning situation, in this case, the question which must be asked is:

- How the system can be adapted "online" to the learner to improve learning?
- How to give more semantic meaning of information to the learners to accomplish their tasks?
- How to make liaison between the available information (knowledge) and proposals for assistance?

II. THE AID SYSTEMS FOR INDIVIDUAL LEARNING

A learning environment is a collection of activities or processes and modules defined to provide the best learning activities with the right tools at the right time according to their needs. According to [6], learning environment functionalities can be cut in a certain number of functions, which can then be implemented separately as autonomous applications or e-Services, by using web services technology whose the objective is to transform the learning environment in a distributed calculation device, where the services can interact intelligently in being able to be discovered automatically, to negotiate among themselves and to compose more complex services [5] to provide some functionalities to the actors of the environment There exist many research works concerning the design and realization of computer systems to assist the learner in the learning process. We find by example, solutions based on agents that integrate and seek to co-operate different intelligent tutoring systems (ITS) [2]. There are also pedagogical agents or guardians accompanying the learner by offering remedial activities [4]. Others offer support agents to guarantee collaboration in learning group [3] encouraging, in turn, learner's participation and facilitate discussion between them. The platform BAGHERA [10], which is an ILE, exploits the concepts and methods of multi-agent approach. BAGHERA assist learners in their work solving exercises in geometry, and can interact with other learners or teachers. Teachers can know the state of progress of learners in order to intervene if necessary. The SAAID system [7], is an aid system for individualized distance learning, that uses an approach based on intelligent tutoring systems (ITS) and multi-agent systems (MAS) in order to produce assistance for learning in the telecommunications and networks field. In [11], the authors propose an open system of ILE for learning and individual monitoring of the learner, who is also based on the multi-agents approach, to produce monitoring based on abandonment cases and difficulties. Most of these tools for distance learning can't provide individualized, appropriate, continuous and real-time assistance of the learner. They include a traditional pedagogical approach (behavioral) based on prescriptive models, instead of adopting the latest didactic approaches (constructivism and social constructivism) that are based on open models to provide real-world environments, rather than predetermined learning sequences.

Our approach is to provide a learning system that incorporates a proactive assistant agent, able to offer a range of services (activity monitoring, progress monitoring, guidance and assistance during the course) to learners in an intelligent manner. In addition, this agent has a learning mechanism to enable it the adaptation to new situations ensuring automatic and continuous assistance to the learner. The system adopts a recent pedagogical and didactical approach, based on constructivist approach which implies a maximum cognitive activity of the learner [9]

III. PROPOSED APPROACH

One of the main objectives of the support system of individual learning is to improve the acceptability of the learning system and increasing the rate of actual use by learners. For achieving these aims we are oriented to the use of distributed architecture based on web services able to coordinate, cooperate and interact for providing useful and appropriate assistance to learners. Our proposal is based on the use of feedback obtained through the analysis and interpretation of information gathered during the learning session, called traces. These tracks, defined as a temporal sequence of observed actions, provide knowledge about the learning situation with reports that answer the question: "What's going on there right now? ".

The identification and preparation of these reports is a complex problem in an ILE. We are oriented towards the use of the web 2.0 tools and techniques which facilitates and favors the learning process [8]. The Reporting is one of the Web 2.0 techniques which offer at all times the possibility to have an accurate report which answers the question "What happened?" Or in an operational context to the question" What's going on there right now? ". They exist other types of reports for meet the analytical question " why does this happen? »And predicts the issue" what will happen? ". All these

different reports are produced most often from a warehouse of data that is fed into the system by the traces collected.

The system allows analyzing the behavior of the learner from the interpretation of information gathered during the learning session (trace) by the observation service for to detect the assistance situations (blocking learner, non completing tasks, requests for assistance, and the situations of difficulty). The traces collected by the observation service will be the source of knowledge for the formulation service the reports and they are stored in a base "session base" and each session will contain all the actions of the learner on the learning system. The representation service is used to exploit the traces for product in output a report more readable and more usable by the analysis service that detects the situation of assistance.

This analysis phase of behavior must be done in continuously and dynamic way. After this phase, the system determines and defines the objective and the specific time of the intervention. The proposal service recommends next the pedagogical assistants adapted to the situation. The selection service retrieves these proposals for the pedagogical agent can select one of this assistance and ultimately presented to the learner.

IV. ASSISTAGENT SYSTEM ARCHITECTURE

The system is composed of four traditional models (Figure I) interface model, learner model, pedagogical model, domain model. For each model can share its information and perform its functions independently, one or more autonomous software components (called service) is associated with each model. Finally, a pedagogical agent charged to supervise the learner's activities and directs them in a direction for to help themselves to acquire knowledge related to training.

4.1. The interface model

This model deals with aspects of interactions with learners. In TEL, it's to offer at the learner the possibility to interact with its environment and to analyze its activity. This module integrates two services: one for the preparation of reports and the other for analysis it.

4.1.1. Report's preparation service

There are found in this service, a treatment of observations in three stages:

- observation and collection of trace ,
- report's formulation,
- And, report's representation.

- **The observation service**. It's a learner observation service whose aim is to collect the interactions between the learner and learning system (interaction: learner - system, learner -content)

This collection can be performed:

- manually Way by a human observer, actor or not the learning situation;
- Audiovisual way through capture devices (cameras, microphones);
- Digitally Way through computer artifacts used in the situation.
- In addition, this collection can be performed directly in the situation or indirectly by the questionnaire's intermediate given to actors. For to avoid manual intervention, our work is limited to the temporal traces of activity (Digital traces). Our system records by automatically way, on one side, a wide variety of traces on the document: the text studied, the moment when it is studied, the time of the study and the number of access to this text. And on the other hand, it also recorded several different tracks: time of connection to the system, successful brands of tests and questionnaires, learner's action on the system or help or assistance requests. At the conclusion of the collection, we recover the primary traces of activity.
- **- The service Formulation.** This service allows extracting useful information and putting them under form of a report with a definite framework.

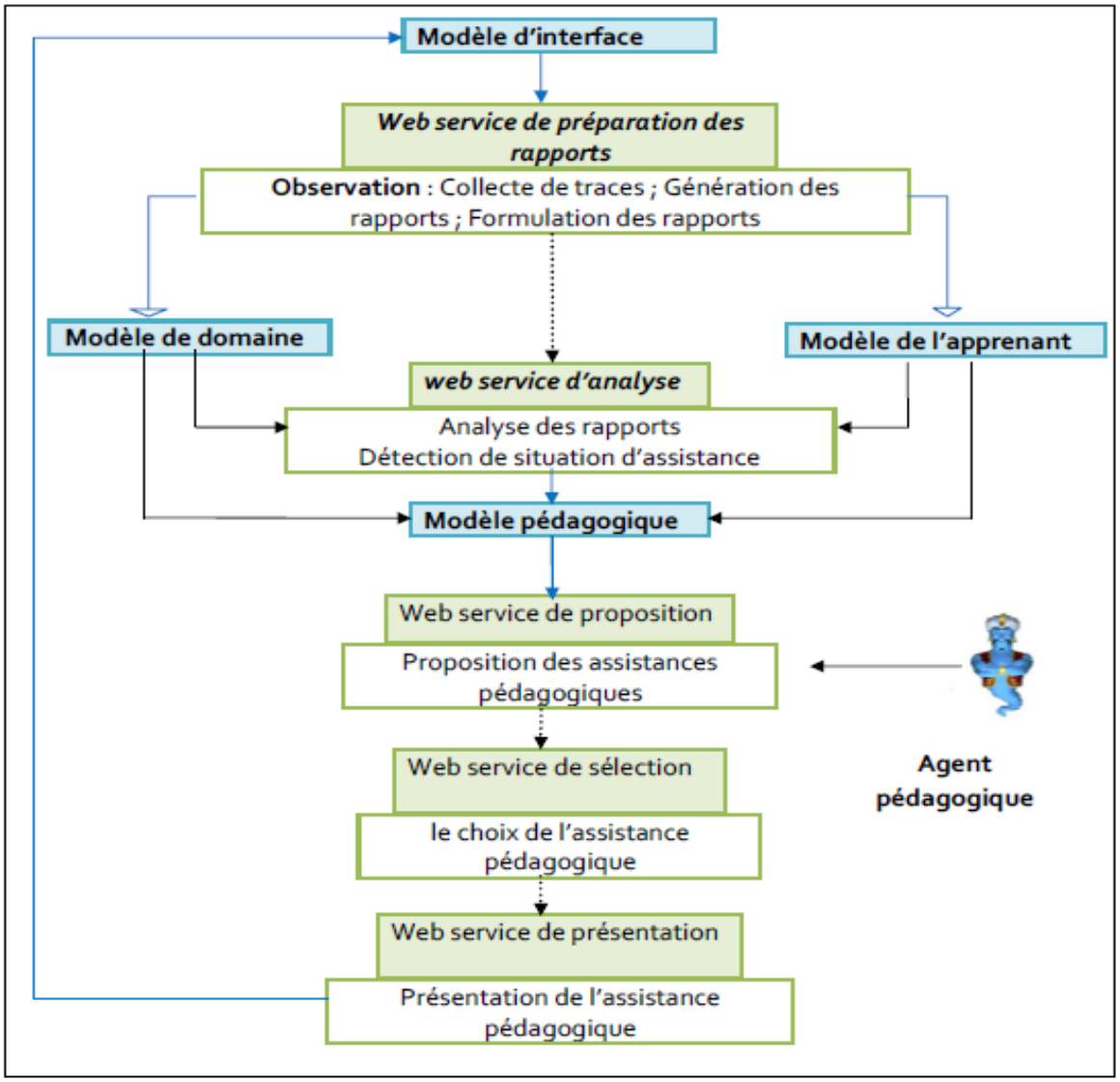

Figure 1. Assistagent System Architecture

The primary trace of the activity is not bearing information on the progress of learning situation; you need to pass by the structure phase. In this phase, the primary trace can undergo different treatments: filtering, structuring and interpretation. For realize these treatments, it seems necessary to construct taxonomy of traces.

For classify these traces, we have sought first to group the tracks according to the information content that they port. We have identified three groups of traces. The first group contains the traces with identifying information: personal information (full name, age,). In a second group, we have gathered traces linked to the exploitation of resource: name, resource reference, a number of Accesses, duration of consultation, and origin of the access and the resources path History. The third group contains the learning activity traces: response time, results of the test and realization of actions.

Following of this classification, the service formulation extracts useful information and put them under form of a report with a definite framework.

- **The implementation service.** Once the report is generated, it's mandatory to formulate to make it more readable and interpretable. To better exploit the reports semantic, we are oriented to graph representation, in other words, each report is represented by a graph, and then the manipulations and exploitation are performed on these graphs.

4.1.2. The analysis service.

This service allows analyzing the reports for detecting assistance situations. The service analyzes the learner's action (the reports) and compares them to be performed actions (domain model). This comparison allows detecting the assistance situations.

4.2. The pedagogical model.

The pedagogical model is the representation of pedagogue in the learning situation [1]. It simulates the pedagogical reasoning; therefore it influences on the pedagogy and on learning. This model allows determining intervention moment to help or to guide the learner. It integrates the proposal service; this service is a mechanism simulates the pedagogical reasoning. It advocates appropriate pedagogical assistants to the situation. To do this, it incorporates an assistant pedagogical agent.

4.3. Pedagogical agent

The object of the system is producing an effective assistance for learners (in difficulty) in TEL. Since this training process does not involve human tutoring, our approach is to provide an accompaniment function through the integration of a pedagogical agent that follows the learner's action during the execution of its learning activity. It should simulate a pedagogical reasoning in order to provide adaptable pedagogical assistance to the assistance situation and to the learner needs.

For resonate the pedagogical agent must obtain:

- ❖ A knowledge representation that characterizes the learning situation (the of the learner's activity in the past).
- ❖ The Knowledge about the current situation (ongoing activities): it represents all the information considered for pedagogical decision making , these knowledge-based:
  - ✓ The work to be done.
  - ✓ The learner: information about its characteristics and its activities.
  - ✓ The actions that the learner must do according to a predefined procedure.

The pedagogical agent must also be capable of enriching the knowledge over time in order for to change the assistance (help) that it provides to users and to adapt to their changing needs.

The functions of our pedagogical agent are classified into four categories:

- Pedagogical Accompanist. Returns to facilitate and arouse learning by encouraging reflection and drawing attention to the point important.

- Technical Accompanist. He must be familiar and comfortable with software, helping learner's to become themselves, solve the problems. It returns him to answer at simple question about technical problems, advised in the adequate choice of communication tools according to type and moments of activities.

- Pedagogue. It performs dependant pedagogical interventions on each learner for redirect his work in a productive management, clarify points of methodology, answers questions relating to content. It intervene quickly when it sees useful (if a learner call him or if it notes a deadlock situation) and appropriately to the learner (to his path in the activity's).

- personalize. It works on the specificity of each course. It must be always listening to learners to help each pass the difficulties, evaluate its needs, its difficulties, its rhythm, and its preferences.

4.3.1. The selection service. The pedagogical agent can select a pedagogical assistance from the proposals.

4.3.2. The presentation service. The selected pedagogical assistance is provided in the system by pedagogical agent, an assistant conversational agent.

4.4. A learner model

The system capable of providing adequate and personalized assistance requires a learning model that contains information about the learner's objectives, needs, preferences or intentions. This model is built dynamically by the collection of the learner traces, but it can also be changed directly by the learner himself when he specifies preferences.

The learner's models are useful to help the system; the answers to questions close preserved in the learner profile can be reused. The learner questions vagueness can produce very different answers. Thus, the learner profile can help to achieve better results.

4.5. Domain model

For allow our system to identify learner's problem, for detect assistance situations and provide answers to specific questions, it is necessary to maintain a knowledge base for the pedagogical agent. The agent Knowledge's are used to identify objects and relationships required by the learner. The use of knowledge can increase the system's ability to produce reasonable answers. Our domain model utilizes ontology that facilitate

the pedagogical contents representation and organization, this ontology allows organizing concepts hierarchically (super-concept and sub-concept).

V. CONCLUSION

In this paper, we have proposed a help system of individual learning capable to improve the acceptability of the system and increase the use of effective assistance system by learners. To do this, we have setting in work an analysis and design process «service web oriented». The proposed architecture is based on four models (interface, learning, pedagogical and domain), each model includes one or more autonomous software components called "web service". The interface model integrates two services: one to prepare accurate reports on the learning situation and the other to analyze and detect assistance situations. The pedagogical model integrates a service proposal that simulates a pedagogical reasoning in order to provide pedagogical assistance adapted to the situation of assistance and to needs of the learner. The latter is assisted by a pedagogical agent whose role is to select assistance from the proposals and present to the learner.

The system AssistAgent version is in progress of realization, currently our focus is on finalizing the web services to define a help system providing a cognitive and affective support more personalized to each learner.

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