A Framework to Synchronize Transfer of Knowledge in Web based Intelligent Tutoring System

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ABSTRACT

Nowadays the Internet constitutes Web based information which is fast and provides face-to-face interaction with the user. E-learning on Internet is rising as a powerful tool for the tutoring system like the feature of direct learning as the Learning Management System. (LMS). But question that arises is whether this will replace human teacher. So in this paper an attempt is made to enhance the Intelligent Tutoring System (ITS) by presenting a way to improve the knowledge transfer from the sources trough the agent like tutor to the destiny like student. As we have generic framework for ITS with the content management, which are a formal framework for Advance Distributed Learning (ADL).

The main theme, we describe the framework of synchronization of learners view with the deliverable contents for effective knowledge transfer in ITS and the role of each module in the system. Further it is proposed to enhance the ADL, that the independence of the knowledge can be organized by dynamically loading the concerned knowledge of the respective course. Our intelligent system can help in learning system to transfer knowledge with fine tuned channel so as to student and tutor can navigate through the online course materials, recommend learning goals, and generate appropriate reading sequences.

1. Introduction

The increasing prevalence of the Internet in homes and public institutions require that educators look beyond generalized approaches to learning and acquiring knowledge. As the cost of technology decreases, many universities are finding ways to bring the benefits of the classroom into a distance-learning setting. However, distance teaching has been described as an industrialized form of education, characterized by rationalization of process, division of labor and mass production. The new information and communication technologies can facilitate this development but only if policy makers are sensitive to the opportunities, especially at an international level. Web-based teaching and learning call for a serious reconsideration of the effectiveness, especially in light of increased demand for education and the opportunities for increased student motivation by new technologies if integrated with knowledge-based design sites.

This paper describes an approach to incorporate the human intelligence in the learning process. It is necessary to add some domain independent knowledge object in the Intelligent Computer Assisted Learning (ICAL)[16]. Further it is proposed the framework of synchronization of learners view with the deliverable contents for effective knowledge transfer in ITS. The role of each module in the system is illustrated to enhance the ADL, that the independence of the knowledge can be organized by dynamically loading the concerned knowledge of the respective course. Whereas many tutoring systems have monotonous delivery of contents in static HTML Web pages of a class textbook or lecture notes,

2. Knowledge Representation

Mike Neubauer [5] indicated that knowledge is gained by forming connections between what is seen now and what was seen before, termed the confusion phase, then by remaining patient, what was known is dislodged by what is new, and knowledge is gained.

Michale Verhaart [6] discussed Knowledge capturing system the difficulty of capturing knowledge provides many challenges. In order to be of any use, this knowledge has to be captured at its source and easily disseminated among those who will be interested or affected by this knowledge. Further in his paper a quotation given by Kaylyn Anderson, “A wise man knows what he know, and he knows what he does not know” a web search found a paper by Dr Phil Goppold. The Art of Not knowing, he makes some interesting observations, in particular the distinction between potential and actual knowledge. Further, he stated, "There is no such thing as knowledge. There is only Knowing is that "what you have between your ears". Kaylyn Anderson disagreed, and stated Knowledge had better be more than "knowing" or even considerations. Knowledge is being able to put into practice what you have learned; many subsequent postings supported this view. Also suggested that knowledge is built up from the study of the current evidence and practice of the current techniques derived from years of research and practice. All of that research and practice is the current justification for their current knowledge (justified true belief)[6].

When educated, we understand the implications and are able to draw conclusions about what we have experienced and about what we will experience, because in becoming educated we have expanded our integrated knowledge base and our ability to use it in new ways. Knowledge capture is having a base knowledge of a topic that can be discussed and even argued.

2.1 Knowledge Management

Knowledge Management (KM) is somewhat old and somewhat new at the same time, it is the combination of new ideas with the ideas ‘everybody knows of old’ [9]. Davenport refers to procedures that drive KM in daily process: Knowledge Management (KM) is a framework and a set of tools to improve an organization knowledge infrastructure, aiming to furnishing the right knowledge to the right person in the right way and in the right moment [2]. The grounds for KM are: exploring knowledge and its adaptability, finding the value of knowledge and actively managing knowledge [14]. KM may be considered

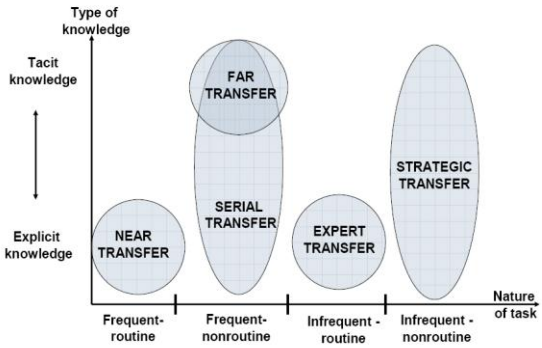
as the process that a) Integrates information (accessing, organizing, storing, searching, recovering, navigating, codifying, referring, categorizing and cataloging it); b) Draws some sense out of incomplete information, and c) Updates information, ensuring its continuity through manual procedures, supplemented by information technologies tools [7,11].

2.2 Knowledge transfer processes and concepts

It has been defined the goal for knowledge transfer in teaching as "tapping of tacit, highly subjective insights or intentions of an individual employee and making these insights available for the whole company". Dixon defined common knowledge as the knowledge that employees generate in the act of accomplishing an organization's tasks in new and innovative ways [3].

Another aspect in common knowledge is that across an organization, many people have very similar knowhow, e.g. like paper industry corporations having similar production plants. The transfer processes for common knowledge have been classified into serial, far, strategic and expert transfer is illustrated in the Figure 1.

The serial transfer process involves transferring the knowledge one team has gained in carrying out its task in one setting to the next team that performs the task in a different setting, the repeated action thus occurring in serial fashion [3].



"Figure 1. Organizational knowledge transfer processes [3]."

The near transfer process involves sharing the explicit knowledge one team has gained from performing a frequent and repeated task to be reused by other teams doing very similar work. Examples of serial transfer process include the "Best Practice Replication" developed by Ford, in which the best practices developed in different vehicle operation plants were shared over the Intranet. The near transfer process can be used in frequent and routine task, when the knowledge is explicit [3]. The far transfer process involves sharing the tacit knowledge gained from carrying out a non-routine task and making it available to other teams performing similar work in other parts of the organization, but in different contexts.

2.3 Domain Knowledge

The KM module includes the knowledge repository (institutional or academic memory) with the codified knowledge as well as an interface to easily 'navigate' it.

The knowledge in the KM module is codified in:

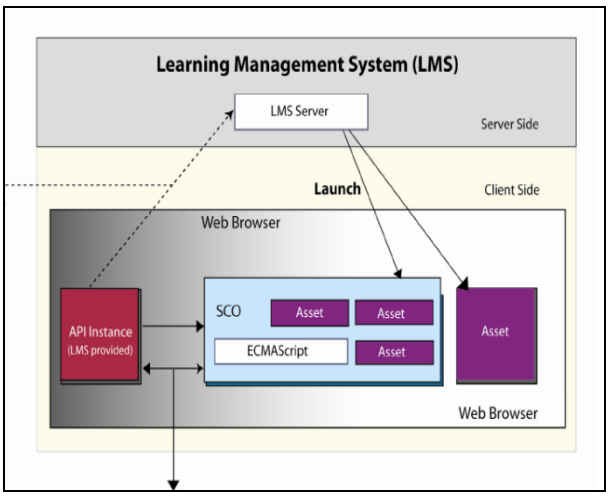
- heuristic knowledge (HK). Examples are best practices, learned lessons, frequent and unfrequented questions.
- Descriptive knowledge (DK). It is a concept or an idea, the knowledge with which a situation is described.
- Procedural knowledge (PK). It is the knowledge required to take an action. It describes a procedure or a
- Anecdotal knowledge (AK). It refers to anecdotes, histories and stories linked to a given knowledge.

The concept of an intelligent organization with agile dynamic competence and capability development processes is so far the best example of an attempt to integrate the processes of knowledge management, strategic competence management and learning into an organizational framework [12].

It has been known to use a term digital know-how development (DKD), which integrates education and learning with the capability to use information and communication technology, e.g. digital communication or interactive multimedia. A further aspect in DKD is the learning goals which define the requirements and content for learning. While the traditional training paradigm functions in a fixed time and place, DKD is most suitable as a continuous learning process integrated into working situations and, in this way, supporting continuous learning.

3. Advance Distributed Learning (ADL):

One of the important and useful Web-Based tool for Teaching and Learning developed under the well known concept is ADL. SCORM was developed to enable the development of content objects that are reusable and interoperable across multiple LMSs [13]. There is a common way to launch and manage content objects, a common mechanism for content objects to communicate with an LMS and a predefined language or vocabulary forming the basis of the communication. As illustrated in Figure 2. these three aspects of the RTE are Launch, API and Data Model.



"Figure 2. General Learning Management System"

Some of the Current Issues and Attitudes Related to E-Learning are knowledge representation, knowledge capture and management, adaptability, domain independence and intelligence. These issues need to be addressed for making e-learning systems real intelligent. In this paper we made attempt to address these issues. One of the major Object Oriented issues can be implemented is Reusability through Reusable Learning Objects.

3.1. Advantages of CAI

Computer-assisted instruction plays a very important role in the modern education process and extensive research shows increasing evidence of the use of computers in the teaching-

learning process. There is a set of evidence that computer assisted instruction, which focuses on higher-order learning in technical education, has been more effective than traditional instruction [16]. It has been shown that computer-assisted instruction has many advantages in teaching learning processes, including the following important elements:

- Learners can progress at their own rate and pace.
- Learners can have more individual considerations.
- Immediate feedback is available.
- Learner's response can be recorded.
- Visualization is properly increased.
- Remedial teaching is eliminated and the problem of discontinuance of learning is avoided.
- A deeper analysis of transfer phenomena is permitted and facilitated.
- An opportunity for the introduction of more effective methods for testing in the teaching/learning process is provided.
- Qualitative and quantitative analysis of student achievements is facilitated.
- Access to supplementary material through links is provided.
- Several complex process and interactions can be explained in simple format.

However, comprehensive research is required to determine the best methodology to be applied to the design and development of computer-assisted instruction, as well as the efficiency of the teaching/learning processes based on this particular method of instruction [8].

3.2. Theoretical framework for individual and class room Learning

Learning theories that have exerted the most influence over the past 50 years can be grouped into four clusters. Following are the best conditions for learning are summarized here:

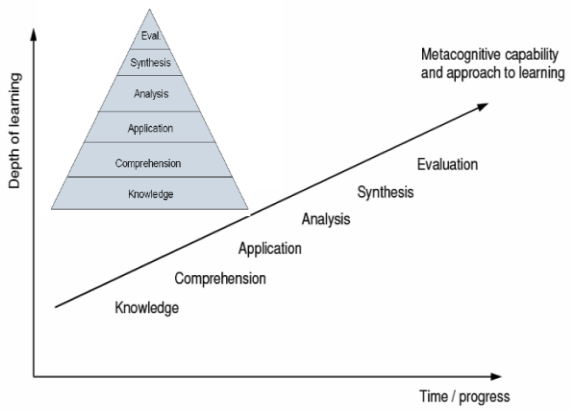
(1) Learning as behavior is a model that asserts that any change in an individual's behavior is the result of events, known as stimuli, and the consequences of these events. Experts and expertise are the sources of learning.

(2) Learning as understanding is based on cognitive learning theories (learning as understanding) and view learning as a process of understanding and internalizing the principles, connections and facts about the world around us. This conceptual know-how is also associated with the ability to apply and to explain the learning points to other people. Content is in the centre of learning.

(3) Learning as knowledge construction is based on constructivist theories that view an individual as an active agent in their own learning stating that all knowledge is personal and exists in people's minds. The learner is the centre of learning.

(4) Learning as a social practice is based on social theories that do not contradict other theories, they simply state that learning is more effective when it arises and is applied in a social setting. Social patterns are a source of learning e.g. problem solving within an
established work process.

Training and learning always start with a need and a situation. The training need defines the depth of learning topics, i.e. the required level of knowledge or skills. One way to define targets for knowledge and competence levels is known as Blooms taxonomy,[18] which is illustrated in Figure 3.



"Figure 3. Bloom's taxonomy for learning"[18]

There are always expectations interlinked with learning, instance a hope for a wider use of new knowledge or skills outside the learning context. Learning new things is always based on prior learning, otherwise each new learning situation would start from scratch. Our experiences from prior learning events may encourage or alert us to leap into further learning [10].

The interface between learning and the transfer of learning is not very clear. It is difficult to define what the original learning situation and the other learning situation are, what is transferred knowledge and what is newly learned knowledge. Often it is not even meaningful to try to define and measure it accurately, the result is more important than how it was reached. We benefit (or suffer) from our prior experiences. People improve in their ability to learn new skills more proficiently because of prior practice on a series of related tasks. This helps us to acquire new views on a topic by looking at the task from a different approach, which strengthens our understanding of the topic. For example, practicing to drive a variety of cars provides experience with different stimulus situations and makes new learning easier [17].

Transfer of learning can de divided into positive and negative, near and far transfer [10,17]

- Positive transfer of learning take place when the skills, knowledge, and/or attitudes that were learned in one situation A assists learning in another situation B.
- Negative transfer of learning hinders the transfer of learned issues from A to B. - Near transfer of learning takes place when skills and knowledge are applied in the same way every time the skills and knowledge are used. Near transfer training usually involves tasks that are procedural in nature, i.e. tasks which are always repeated in the same order. This type of training is easier to go through and the transfer of learning is usually a success, but the learner is unlikely to be able to adapt their skills and knowledge to changes.
- Far transfer of learning involves tasks, in which the skills and knowledge being applied in changeable situations. Far transfer tasks require instruction in which the learners are trained to adapt guidelines to changing situations or environments. It does allow the learner to adapt their new skills to new situations.

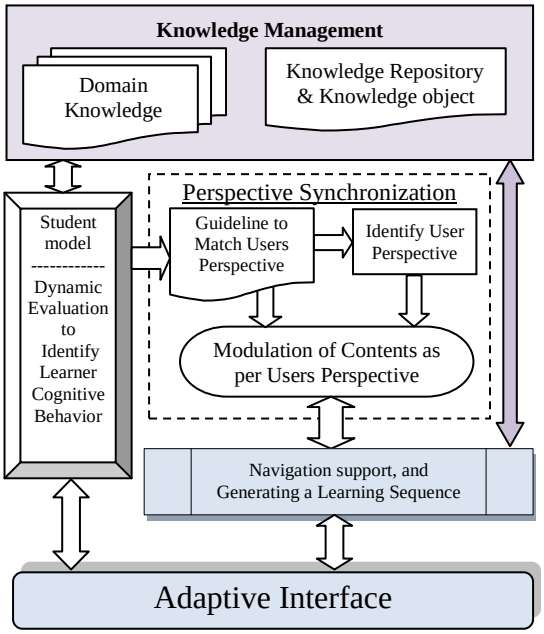
According to Management Sciences the conventional measure of learning, i.e. cumulative output, significantly overstates the persistence of learning. The amount of knowledge or skills transferred to a job and used persistently often remains fairly minor. Labor turnover is usually not the main reason for this conclusion; it is usually more about incapable organizations than incapable individuals. To gain long-term positive effects, not only the training but also the circumstances in a workplace need to be supportive.

4. The proposed framework to synchronize transfer of knowledge

In the traditional training and development paradigm, the instructor is the centre of the knowledge and the classroom is the fixed location for knowledge transfer taking place in a fixed time. In the new paradigm, the employee/learner is a knowledge seeker having constantly changing learning needs and in different time frames. According to Dr. Ali the topic contents to be organized in hierarchical structural manner from the knowledge resources [1]. Asynchronous and synchronous learning tools enable access both to knowledge resources, including computer-based learning tools, and to human networks which gives more just-on-time flexibility.

In a framework of a WITS which is an open system, contributes domain knowledge development, knowledge delivery, building interest in learning a topic, assigning suitable example, understanding the concepts, learners evaluation and capability development. These critical teaching processes take place at five levels. These processes should be integrated with existing teaching and learning development processes, confirming the knowledge stocks and flows in the different levels of the courses. The experts should create an environment and conditions that enable and facilitate knowledge transfer in teaching learning process.

There is a need to take a review on knowledge model construction [11] to have an integrated concept for knowledge object building, modulating course material, evaluating learners behavior and strategic teaching management, the proposed frameworks in the literature reviewed in this study have been partially implemented thus tend to lack the effective use of ITS systems in practice. These frameworks have illustrated outer layer for WITS. The research related to knowledge, competence and learning as a competitive edge has been carried out in different disciplines, including strategic management, knowledge management, education and learning, performance improvement, and organization learning. But needed focus on synchronization of learner understanding and teaching strategy.



"Figure 4. Frame-work for Perspective Synchronization for Knowledge Transfer in WITS"

Knowledge Management is: The knowledge refers to a knowledge object. Each knowledge object is linked to other types of knowledge. The attributes of knowledge are: description, learning strategy, importance (fundamental, non fundamental), medium (text, video, sound, multimedia), required level (basic, medium, advanced), responsible professor and topic. The counter tallies the number of accesses to the record. With the counter, the system is able to reclassify a question or to decide the most consulted knowledge objects. For example, at the beginning of a new course, such a re-classifying could be made.

In the knowledge repository, all of the knowledge that the professor considers necessary will be initially stored. For gathering the knowledge requirements, techniques of knowledge engineering, such as interviews, analysis of protocols and observation, as well as techniques used in the area of software requirements engineering might be used.

The student model represents a student or a group. When interacting with the environment, through access to the KM module, 'portfolio of works' containing a log of the activities performed and learning preferences is recorded. Thus identify learner cognitive behavior. This information may be used by the intelligent tutorship. Using adaptive interface the student entity can collaborate in the evaluation of the types of knowledge is able to reclassify them as needed and, if necessary, may incorporate learned lessons. In this way, learner's perspective is extracted and his need to understand the topic is identified.

The above information is then sent to the perspective synchronization unit. This unit is composed of Guideline to characterize the behavior of the learner. On the basis of this classification and matching parameters information the next component will work to identify the learner perspective.

The modulation unit, restructure the knowledge object delivery according to the students perspective. In this way the modulation is able to adjust the contents of the KM module. When required parameters are tuned for transfer of knowledge from ITS to learners perspective the set of values of tuned parameters are sent to the sequence generator.

Sequence generator generates the online deliverable with navigation tool. The process carries out the intelligent tutorship, observing the user actions and suggesting action roads according to the user preferences. For example, if a student prefers certain types of knowledge, when facing new requirements knowledge of those same types could be offered. Thus the synchronized transfer of knowledge is attempted and validated it through adaptive interface.

5. Conclusion

The WITS provide users may learn computer-based skills in an environment which incorporates many of the advantages of instructional models. The synchronize framework, in fact, may offer advantages over human mentors in that students are supported without the angst of being watched by someone who may wield power over them.

Web Intelligence explores the practical applications of Artificial Intelligence to the next generation of Web empowered systems [15]. The proposed system improves a Web-based intelligent tutoring system implementation. It can help a learner to navigate when a particular concept is not understood. Finally, when a student wants to learn a particular concept without learning all of the previous concepts, it facilitate to match the learners perspective with minimum prerequisite knowledge needed in order to understand the desired concept in the proper learning sequence.

Students are thus able to learn in a non-focused environment in which sequence of understanding path to the current subject are not met with the dissatisfaction of an nonspecific teacher. Lastly, multiple in person advisors may offer an advantage over

a single tutor if their diversity successfully mirrors and conveys the clear-cut distinctions in the tutored domain.

In this paper we have discussed three main components where fine tuning between teacher and tutor is attempted with some typical scenarios and their related proposition, based on the learning flow, the content and the interface. Also, we have stated the three different inputs involved in the synchronization process: a) the user, based on his behavior and his feedback; b) the personal decision of the teacher; and d) the set of views matching in the processor, predefined by a expert designer.

The assessment system proposed in [4] focuses solely on assessing what a student knows. Our intelligent tutoring system not only assesses what a student knows, but, in addition, assists the student to understand and fast learning the unknown concepts.

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