An Innovation towards Intelligent E-Learning Systems: A Study

Priyanka Jain 1, Saurabh K Rajput 2, Sumit Kumar Singh 3, Anuj Kumar 4
1 Department of Computer Science, Maharaja Agarsain Institute of Technology, Ghaziabad
2 M.Tech Scholar, Al-Falah School of Engineering & Technology, Faridabad
3 Department of Electrical and Electronics, NITRA Technical Campus, Ghaziabad
4 priyanka6285@gmail.com, saurabh9march@gmail.com, er.sumit.software@gmail.com, anujnsc@gmail.com

Abstract- In this paper we present how the traditional learning styles are reformed by E-Learning Systems and now a days due to rapid technological enhancements they are refitted by Intelligent E-Learning systems. We discuss the artificial intelligence techniques used in implementing the Intelligent Learning systems IITS.

Keywords: E-Learning, Intelligent Agents, IITS, SCORM

[1] Introduction

Technological Era has changed the way of Learning. Learning, a distinguished feature of education provides a better way for the survival and this could be found difficult due to the lack of resources, tools, skilled teachers, infrastructure. So a new way has been innovated to overcome these difficulties as E-Learning. E-Learning “Anywhere and Anytime Learning” excavating into the education system as an independent method for acquiring knowledge, instructing and training. E-Learning Systems plays a remarkable role in lifelong learning. Section II describes the evolution of e-learning systems towards intelligent systems, Section III presents artificial intelligent techniques implemented in e-learning systems, Section IV working model of Interactive Intelligent Tutoring Systems and finally the conclusion of the paper.


Traditional Learning Systems use the blackboard and chalk style method in the classroom which is limited to a small area, ineffective method of learning. This has been rectified by Technology based Learning where students receive their learning through computers at a time and place that is convenient to their schedule. Advantage of technology based learning systems includes reduction of cost in terms of travel expenses and time but this also has a disadvantage that there is no consideration on the effectiveness of delivery of lecture/instructions with the medium. These problems paced the path for the innovation of E-Learning Systems. E-Learning systems facilitate 24/7 access to the educational resources for enriching knowledge, learning, skills of learner delivered via range of web based communication technology. These systems provide student centered control that offers an efficient, effective and interactive way for peer-to-peer communication between learner and instructor. It also improves the learning performance by constructing and organizing high quality interactive presentation methods according to the need of learners ensuring to implement a lifelong process for creating and updating course materials. Currently due to the technological enhancements knowledge engineers proposed artificial intelligence approach towards e-learning systems that overcome a variety of problems related to education, learning and training.

[3] Role of Intelligent Methodologies in E-Learning Systems

Artificial Intelligence is the branch of computer science aims to develop intelligent machines that are the replica of human beings. John McCarthy who coined the term in 1956 it as a “science and engineering of intelligent machines”

[4] Artificial Intelligence AI-ED (Artificial Intelligence in Education) is intelligent software used in real teaching, learning and training. Main areas are Intelligent Education System (IES), Teaching and Learning aspects, Cognitive Psychology, Knowledge Management, Intelligent agents & tools [1].

[3.1] Machine Learning

Machine learning is the science of getting computers to act without being explicitly programmed. In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome. Machine learning is so pervasive today that you probably use it dozens of times a day without knowing it. Many researchers also think it is the best way to make progress towards human-level AI[12].
Cognitive Science

Cognitive science is the interdisciplinary scientific study of the mind and its processes. It examines what cognition is, what it does and how it works. It includes research on intelligence and behavior, especially focusing on how information is represented, processed, and transformed (in faculties such as perception, language, memory, reasoning, and emotion) within nervous systems (human or other animal) and machines (e.g. computers). Cognitive Science consists of multiple disciplines, including psychology, philosophy and neuroscience. It spans many levels of analysis, from low-level learning and decision mechanisms to high-level logic and planning; from neural circuitry to modular brain organization. The fundamental concept of cognitive science is “that thinking can best be understood in terms of representational structures in the mind and computational procedures that operate on those structures [11].”

Planning and Scheduling

Automated planning and scheduling is a branch of artificial intelligence that concerns the realization of strategies or action sequences, typically for execution by intelligent agents, autonomous robots and unmanned vehicles. Unlike classical control and classification problems, the solutions are complex and must be discovered and optimized in multidimensional space. Planning is also related to decision theory.

In known environments with available models, planning can be done offline. Solutions can be found and evaluated prior to execution. In dynamically unknown environments, the strategy often needs to be revised online. Models and policies must be adapted. Solutions usually resort to iterative trial and error processes commonly seen in artificial intelligence. These include dynamic programming, reinforcement learning and combinatorial optimization. Languages used to describe planning and scheduling are often called action languages [13].

Case Based Reasoning

Case based reasoning is an analogical reasoning that provides a methodology of solving new problems to the similar solutions to past events. In case-based reasoning (CBR) systems expertise is embodied in a library of past cases, rather than being encoded in classical rules. Each case typically contains a description of the problem, plus a solution and/or the outcome. The knowledge and reasoning process used by an expert to solve the problem is not recorded, but is implicit in the solution.

To solve a current problem, the problem is matched against the cases in the case base, and similar cases are retrieved. The retrieved cases are used to suggest a solution which is reused and tested for success. If necessary, the solution is then revised. Finally the current problem and the final solution are retained as part of a new case[14].

Multi Agent Systems

A multi-agent system (MAS) is a system composed of multiple interacting intelligent agents within an environment. Multi-agent systems can be used to solve problems that are difficult or impossible for an individual agent or a monolithic system to solve. Intelligence may include some methodic, functional, procedural or algorithmic search, find and processing approach [15].

Data Mining

Data Mining is an interdisciplinary field that aims to extract useful knowledge and extract the hidden patterns from huge amount of databases. Data mining (sometimes called data or knowledge discovery) is the process of analyzing data from different perspectives and summarizing it into useful information - information that can be used to increase revenue, cuts costs, or both. Data mining software is one of a number of analytical tools for analyzing data. It allows users to analyze data from many different dimensions or angles, categorize it, and summarize the relationships identified. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases [16].

Adaptive Hypermedia

Adaptive hypermedia, abbreviated as AH, is the next generation of hypermedia applications. Where hypermedia serves the same pages and the same set of links to all users, adaptive hypermedia improves the usability of hypermedia by building a model of the preferences and knowledge of an individual user and uses this information to adapt the hypertext to the needs of that particular user.
Interactive Intelligent Tutoring System

The general architecture of Interactive Intelligent tutoring system is a web enabled object oriented architecture empowering the course instruction material on different platforms. The interoperability and scalability of generic architecture is key to the successful translation of the intelligent components into a reusable, dynamic e-learning environment [9]. It provide the tools to needed to share knowledge around a large number of students and make decisions relevant to their learning goals. E-Learning systems provide environments in which learners independence, cooperation and collaboration are promoted.

IITS (Interactive Intelligent Tutoring System) apply artificial intelligent techniques to the development of e-learning systems able to adapt dynamically to the learning evolution. Artificial Intelligent techniques plays a remarkable and challenging role in the development of smart e-learning systems.

According to [10] Each IITS must have the four model components.

- Domain Model
- Teaching Model
- Learner Model
- Communication Model

**Domain Model**

The following are the tasks of domain model.
- Current actions performed by a learner.
- Diagnosis of cognitive skills directly related to problem solving processes.
- Provides a knowledge elicitation method so that only that amount of information is retrieved to the learner.

**Teaching Model**

The following are the tasks of Teaching model.
- Representation of different teaching strategies and methods
- Designing of course contents
- Evaluation Method for virtual teaching.
- Organizing Instruction in order

**Learner Model**

The following are the tasks of Learner Model
- Construct the image of system that has the knowledge which the student has acquired.
- Evaluates the behaviour of learner
- Evaluate perceptual abilities, knowledge and reasoning skills.

**Communication Model**

The following are the tasks of Communication model
- Provides a transparent access to the learning environment
- Provide an interactive environment with the learner.

The following table shows that Artificial Intelligence techniques used in IITS. All techniques of AI implementing are interrelated to each other.

<table>
<thead>
<tr>
<th>Model</th>
<th>AI Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain Model</td>
<td>Multi Agents, Cognitive Science, Data Mining</td>
</tr>
</tbody>
</table>
An Innovation towards Intelligent E-Learning Systems: A Study

<table>
<thead>
<tr>
<th>Teaching Model</th>
<th>Case based Reasoning, Scheduling, Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner Model</td>
<td>Machine Learning</td>
</tr>
<tr>
<td>Communication Model</td>
<td>Multimedia, Adaptive Hypermedia</td>
</tr>
</tbody>
</table>

Thus using the artificial Intelligence techniques we build an interactive smart learning system. Then these systems will be applicable in different domains and tasks like biological sciences, medical science, business, corporate training and education.

[5] Conclusion

Learning Systems are well known popular in the market due to a large number of facilities that make a flexible and efficient learning. This increasing number of platforms and tools related to virtual education environment has led to the creation of different standards such as SCORM, IMS LD etc. These systems do not replace the teachers/instructors but they enhance the capabilities of Instructor so that they can easily construct the course materials to the learners, update and modify according to their updating demands. Feedback or evaluation methods are continual process in the whole scenario so that the performance should be upgraded. These Learning systems provide well planned and properly supported education and training environment. Evaluation and monitoring techniques should be made into proper consideration because our main aim is to develop the e-learning systems not only making students learn but improves the performance of students.

References

[12] https://www.coursera.org/course/ml