

# Dynamic Case-Based Reasoning Based on the Multi-Agent Systems: Individualized Follow-Up of Learners in Distance Learning

<sup>1</sup> , <sup>2</sup> A. Zouhair, <sup>1</sup> E. M. En-Naimi, <sup>1</sup> B. Amami,  
<sup>2</sup> H. Boukachour, <sup>2</sup> P. Person, <sup>2</sup> C. Bertelle  
abdelhamid.zouhair@litislab.fr

<sup>1</sup> LIST Laboratory, The FST of Tangier, Morocco

<sup>2</sup> LITIS Laboratory, The University of Le Havre, France

IDC 2012, September 24-26, 2012, Calabria, Italy

# Outline

- 1 E-learning and Intelligent Tutoring System
- 2 Learners Drop-out
- 3 Our Contribution
- 4 Conclusion and Perspectives

## E-learning: A Definition (European Commission)

"The use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration "  
[europa, 2012]

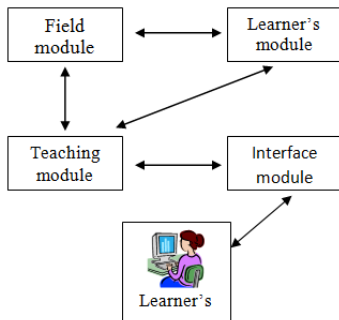
## E-learning a Necessity in Today's Society

- Learners remote from each other
- A lack of trainers or training rooms
- Many learners training in a short span of time
- Students can follow the training at other universities without leaving their country
- Lower costs of training
- ...

# Intelligent Tutoring System: Definition and Architecture

## Intelligent Tutoring System

ITS are computer systems designed for supporting and improving learning together with teaching process in the domain knowledge



## The Limits of E-learning Platform

- The e-learning platform does not allow an individualized learner follow-up ;
- They are specific to learning object ;
- Learner sociological isolation ;
- The loss of motivation and autonomy of the learner ;
- ...

# Learners Drop-out

## Learners Drop-out

The learners drop-out rate is very high:

- 1996 : The rates of learners who left their training, increased from 30 to 80 %, [Bourdages, 1996]
- 2001 : According to [Gauthier, 2001], the drop-out rate was over 50 % as an average
- 2008 : The drop-out rates passed from 20 to 70 %, [Audet, 2008]
- 2011 : According to [usamvcluj, 2012], The drop-out rate for Distance learning Bachelor study, 2010-2011 academic year was over 20 % as an average.

## ITS: our Goals

- To initiate learning and provide a individualized learner monitoring
  - To react according to learner's profile
  - To predict and reduce the number of drop-out
- ⇒ Collaboration between virtual and human tutors

# Case-Based Reasoning Systems

## Definition

Case-Based Reasoning is an artificial intelligence methodology which aims at solving new problems based on past experience or the solutions of similar previous problems in the available memory [Kolodner, 1993].

## Case definition

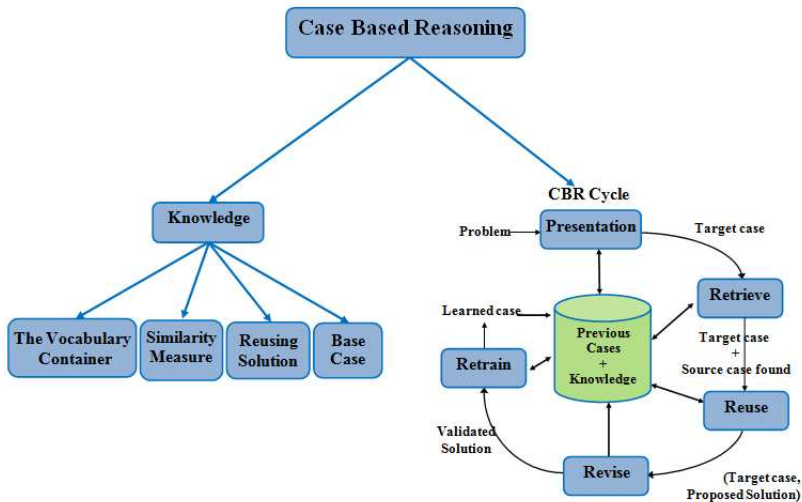
a case is represented by the formalized description of an episode, and the proposed solution to the episode.

## We distinguish the source case and target case

The solved problems are called source cases and are stored in a database. The problem to be solved is stored as a new case and is called target case.



# Components of a Case-Based Reasoning Systems



# Categories of Applications in Case-Based Reasoning Systems

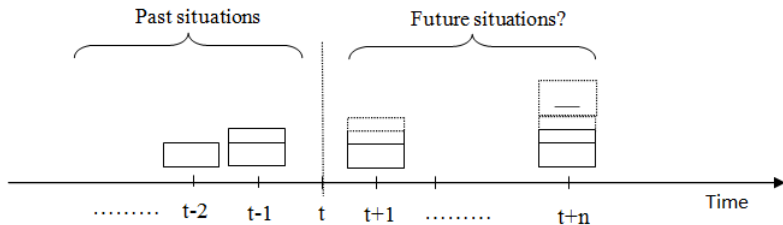
## Applications dealing with situations known as "static"

- In this approach, the problem must be completely described before the research begins in the case base
- Example systems : CHEF [Hammond, 1986] and CREEK [Aamodt, 2004]

## Applications with dynamic situations

- They differ when we compare them to static cases by the fact that they deal with temporal target cases (the situation)
- Example : REBECAS [Rougegrez, 1998], CASEP2 [Zehraoui, 2004] and S-MAS [Cristian Pinzón et al., 2011].

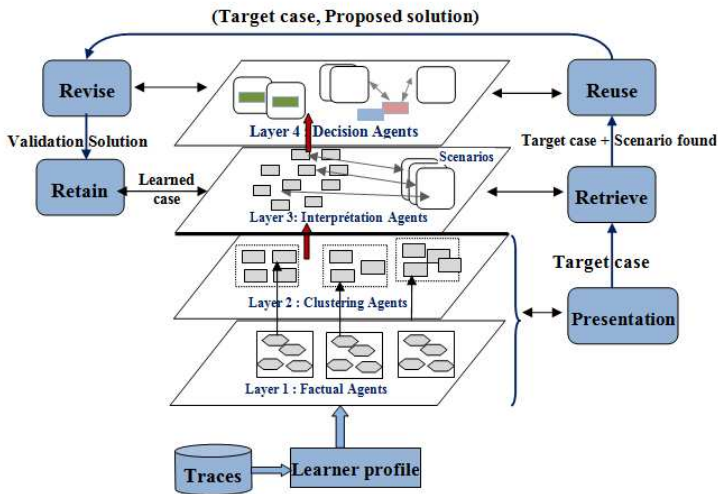
# Dynamic Case-Based Reasoning



The CBR which we propose offer important features:

- (1) It is dynamic ;
- (2) It is incremental: For the same target case, the trace evolves in a dynamic way.

# Multi-Agent Dynamic Case Based Reasoning



# Learner Traces

## The traces contain

- History
- Interactions chronology
- Productions left by the learner during his/her apprenticeship
- We formalize the learner traces through the concept of semantic feature

## Semantic Features

A semantic feature is a description of an object with a set of couples (qualification,value).

## Example

(Patrick, (IP Address , 192.168.1.1), (exercise, 2), (time, 5pm))

## Conclusion and perspectives

### Conclusion and perspectives

Intelligent tutor based on:

- MAS multilayer
- Trace / learner profile
- Kernel portability MAS (JADE)

Work in progress:

- Implementing a new similarity measure in interpretation layer
- Developing the decision layer

Thank you for your attention!

## Bibliography

Aamodt A., Knowledge-Intensive Case-Based Reasoning and Sustained Learning. Proc. of the 9th European Conference on Artificial Intelligence, ECCBR'04, Lecture Notes in Artificial Intelligence, pp.1-15, Springer, 2004.

Audet L., Recherche sur les facteurs qui influencent la persévérance et la réussite scolaire en formation à distance. Récupéré le 05 mars 2011 du site du Réseau d'enseignement francophone à distance du Canada, <http://www.refad.ca/>, 2008.

Bourdages L., La persistance et la non-persistance aux études universitaires sur campus et en formation à distance. Revue DistanceS, Vol. 1, n° 1. Récupéré du site de la revue : <http://cqfd.teluq.quebec.ca/>, 1996.



## Bibliography

Pinzón Cristian I., Javier Bajo, Juan F., Juan M. Corchado b,  
S-MAS: An adaptive hierarchical distributed multi-agent  
architecture for blocking malicious SOAP messages within Web  
Services environments, Expert Systems with Applications Volume  
38, Issue 5, May 2011, Pages 5486-5499,  
<http://www.sciencedirect.com/science/article/pii/S0957417410012327>  
Defimedia <http://www.definition.be/defipoints/point2.asp>

Europa: <http://ec.europa.eu/>

Gauthier P. D., La dimension cachée du E-learning, De la  
motivation à l'abandon ? Disponible sur le site personnel de  
l'auteur, <http://www.phdgauthier.net/>, 2002.

Hammond K. J., CHEF : A model of case-based planning. Dans  
AAAI, p. 267-271. 1986.

Kolodner J., Case-based reasoning, San Mateo, CA, Morgan

## Bibliography

Rougegrez-Loriette S., Raisonement à partir de cas pour des évolutions spatio-temporelles de processus, revue internationale de géomatique, journées Cassini, vol. 8, n 1-2, pages 207-227, 26-27, 1998.

Zehraoui F., Systèmes d'apprentissage connexionnistes et raisonnement à partir de cas pour la classification et le classement de séquences. Thèse de doctorat, Université Paris13, 2004.

usamvcluj, <http://www.usamvcluj.ro/cercetare/online/evaluare-eua/appendices/Students.pdf>