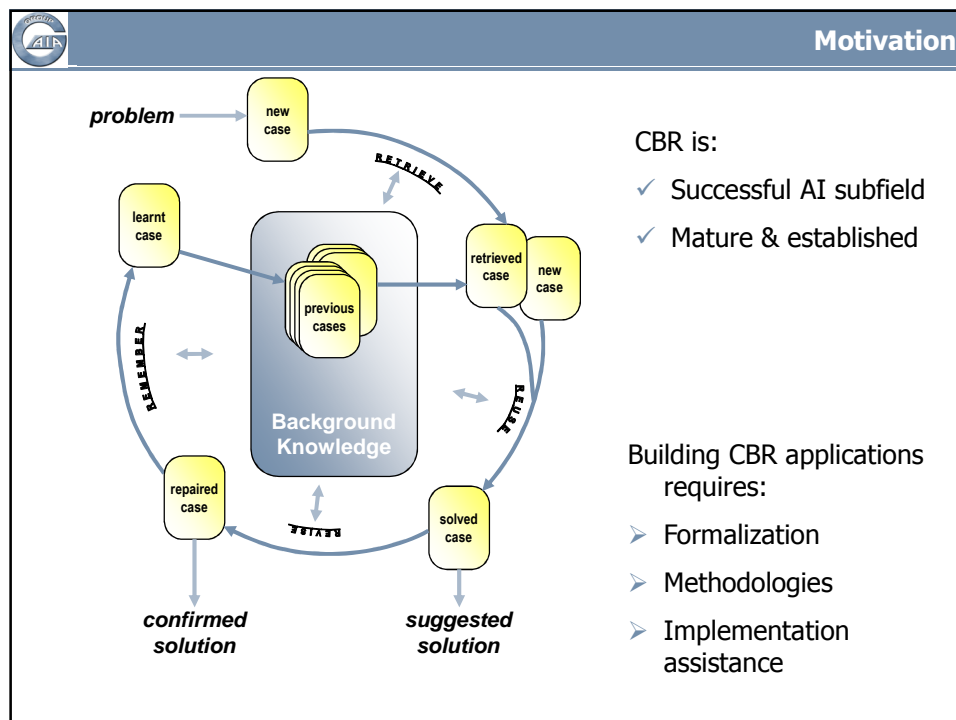


# jCOLIBRI CBR Framework

Juan A. Recio-García



Group for Artificial Intelligence Applications  
Department of Software Engineering and Artificial Intelligence  
Universidad Complutense de Madrid

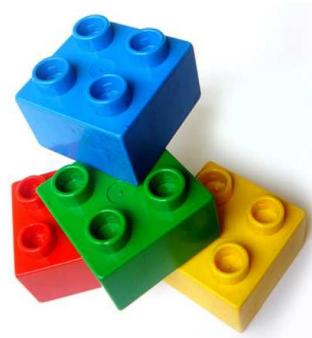
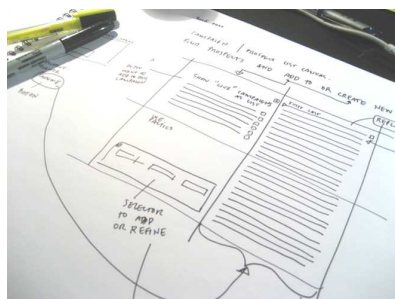




**Platform for developing CBR applications**



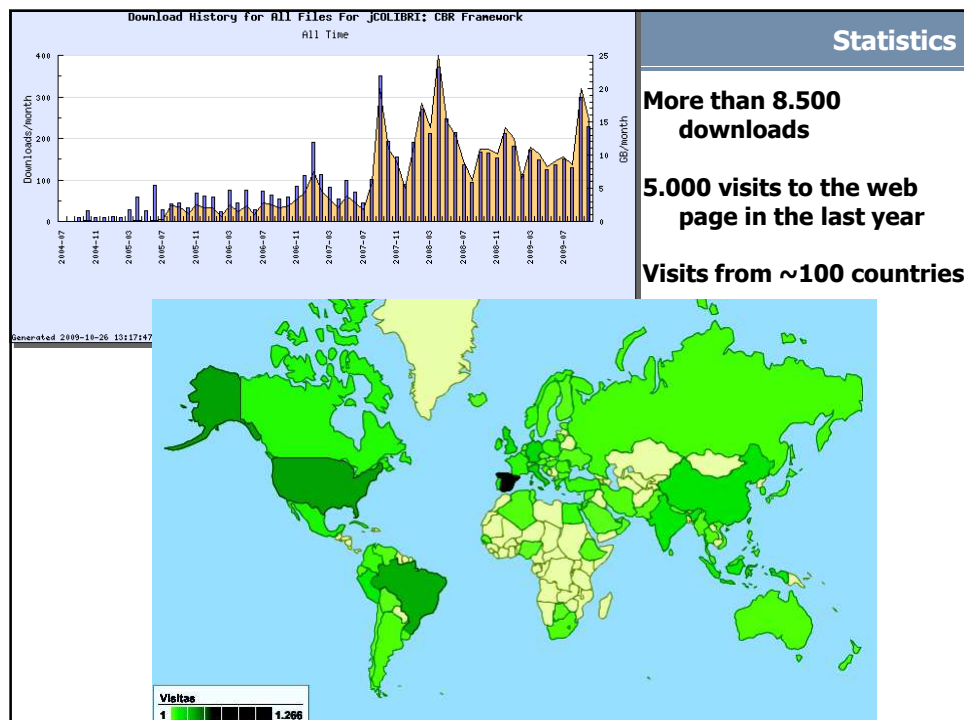
Platform = Reference Architecture + Imp





### Main features of jCOLIBRI

- ❑ Extensible
- ❑ Reusable
- ❑ Different types of **users** and different **purposes**:
  - ❑ Development, Research and/or Teaching
- ❑ Compatible with **commercial** applications and suitable for developing **large scale** applications
- ❑ Supporting different **types of CBR systems**
- ❑ It is just a .jar file → **Suitable for web applications**





## Academic & Commercial World Usage

### Many Universities using jCOLIBRI for teaching or research

- ☐ Université Pierre et Marie Curie (Paris, France)
- ☐ Georgia Institute of Technology (Georgia, USA)
- ☐ Indian Institute of Technology (Chennai, India)
- ☐ The Robert Gordon University (Aberdeen, United Kingdom)
- ☐ University College Cork (Cork, Ireland)
- ☐ ...

### Commercial Applications



KOBAS:  
knowledge  
management  
system  
(Romania)



Intelligence  
system for  
failure  
diagnostics in  
trains  
(Portugal)

### Research Projects

- ☐ European Project ONE (IST-034744)



## External Contributions

### Collaborations



Coláiste na hOllscoile Corcaigh, Éire  
University College Cork, Ireland




Where to start?

## http://www.jcolibri.net



### jCOLIBRI2 Tutorial

Juan A. Recio-García  
 Belén Díaz-Agudo  
 Pedro González-Calero


September 18, 2007  
 Document version 0.90

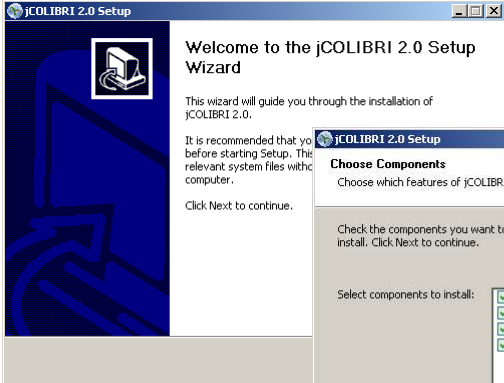



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Installation







## Examples

jCOLIBRI2

- Examples
- Uninstall
- Website
- Travel Recommender

### Define Query

Attribute	Value
HolidayType	Skiing
Number of persons	2
Region	Spain
Transportation	Plane
Duration	
Season	July
Accommodation	ThreeStars

Exit Set Query >>

### Configure Similarity

Attribute	Function	Weight	Function Params.
HolidayType	Equal		
Number of persons	Internal		
Region	OneCosine		
Transportation	Equal		
Duration	Threshold		
Season	EventCyclicSets...		
Accommodation	EventDistance		

Exit Set Similarity Configuration >>

### Retain Cases


<< Journey94 (1/8) >>

Description	
HolidayType	Skiing
Number of persons	2
Region	Bulgaria
Transportation	Plane
Duration	7
Season	January
Accommodation	ThreeStars

Solution	
Price	1558
Hotel	Hotel Phoenix, Sunny Beach

☒ Save Case with name Journey1026 Apply

Exit Next >>



## More Examples

jCOLIBRI2

- Examples
- Uninstall
- Website
- Travel Recommender

### jCOLIBRI2 Tester

Available Tests

- Test 1 - Database:J2N
- Test 2 - Enumerated types
- Test 3 - Compound attributes
- Test 4 - Simple adaptation methods
- Test 5 - Database and Ontologies
- Test 6 - Plain Text Connector
- Test 7 - Maintenance
- Test 8 - Evaluation
- Test 9 - Visualization
- Test 10 - Ontology connector
- Test 11 - Ontology Slim
- Test 12a - Gale
- Test 12b - OpenNLP
- Test 13a - IE
- Test 13b - Lucene
- Test 14 - Evaluation of accuracy
- Test 15 - Evaluation of maintenance
- Test 16 - Spam Filter Toy

Execute

Test 1 shows how to use a simple database (Hibernate) connector and perform the KNN retrieval.

It uses the well known travel recommendation example with flat cases.

Each case has description but it has not solution nor result.

This test exemplifies how to use the database connector implemented through Hibernate and its configuration files.

Please, go through the Java Code of the test example to get more information.

Execution log

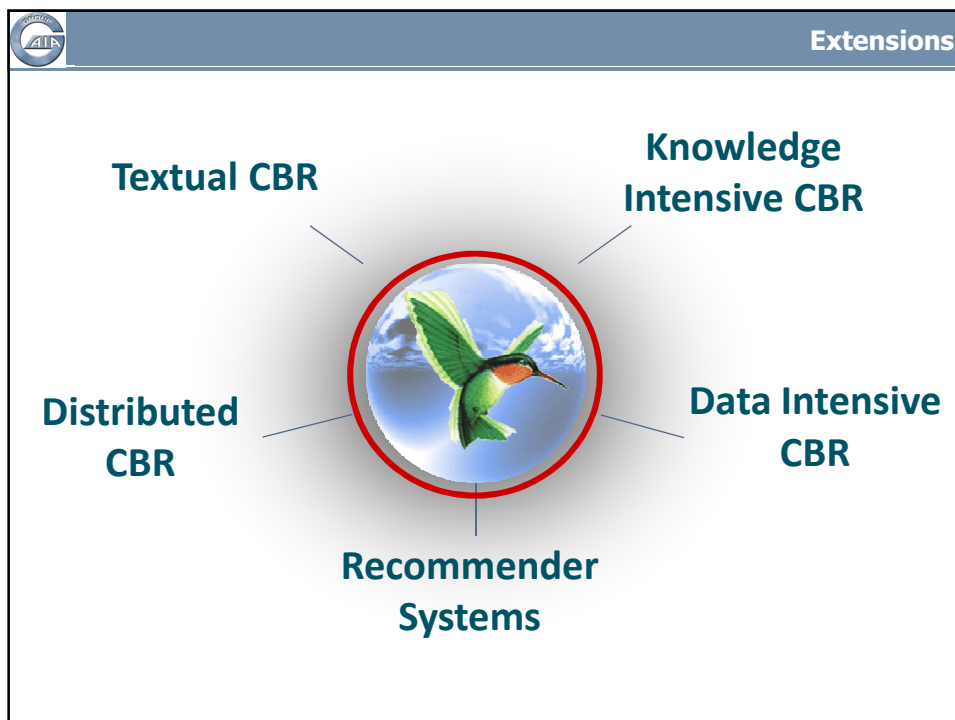
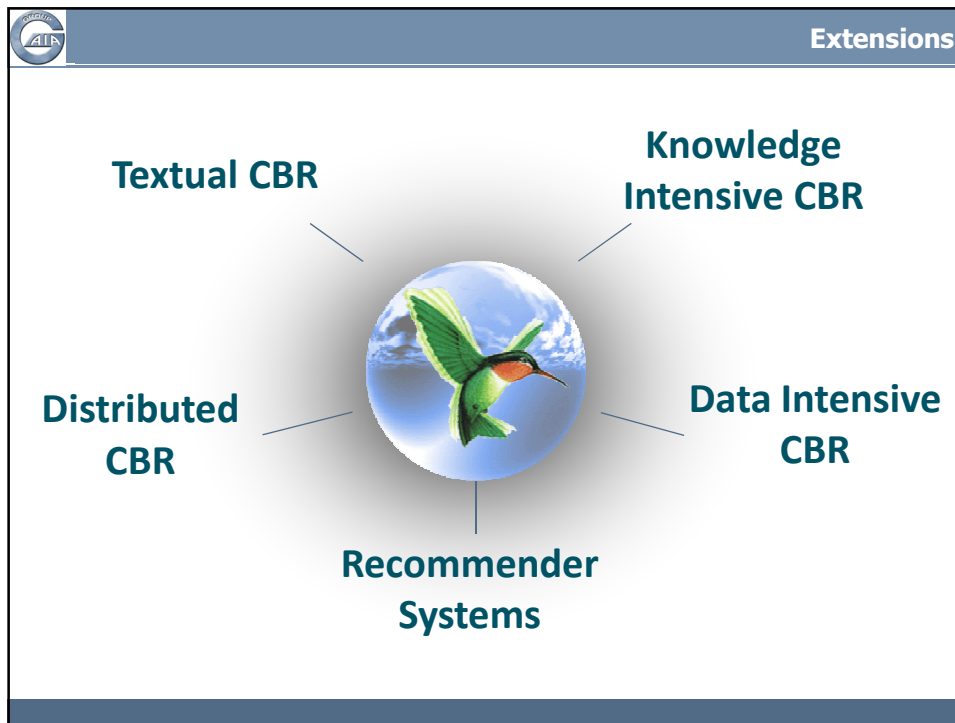
```
[Description: (Journey93; Recreation;918;2;ErsGebirge; Car; 7; May; ThreeStars;
[Description: (Journey706; Recreation;938;2;GiantMountains; Car; 7; June; Three
Cycle finished. Type exit to idem or enter to repeat the cycle
13:59:22,062 INFO MainTester:237 - Test execution finished
```

## My first CBR application with jCOLIBRI

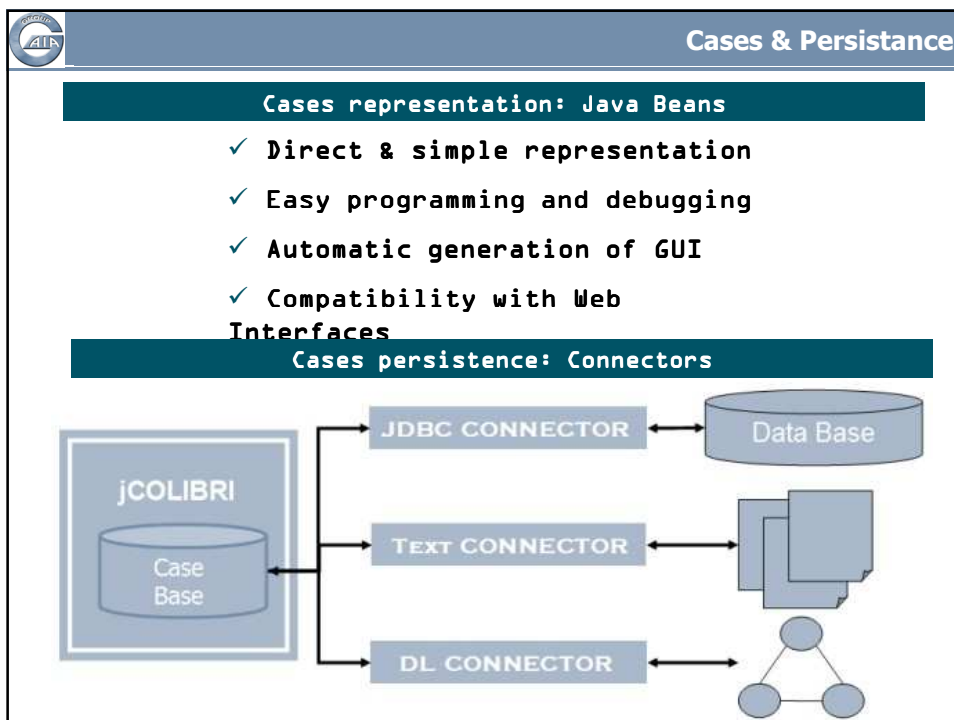
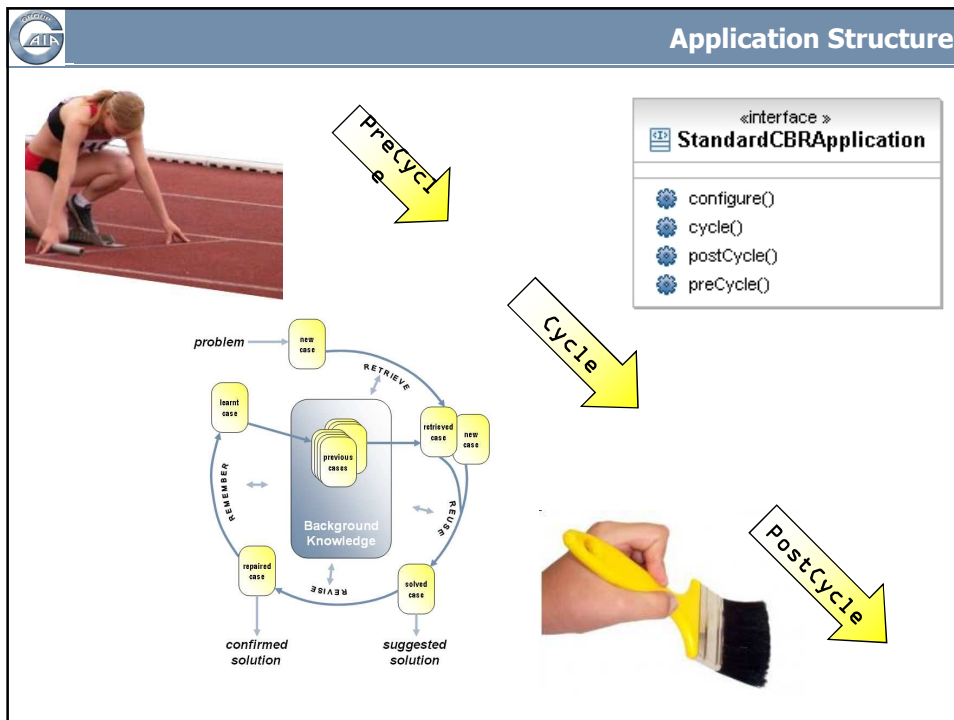
→ Tutorial shows -step by step- how to build a travel advisor system

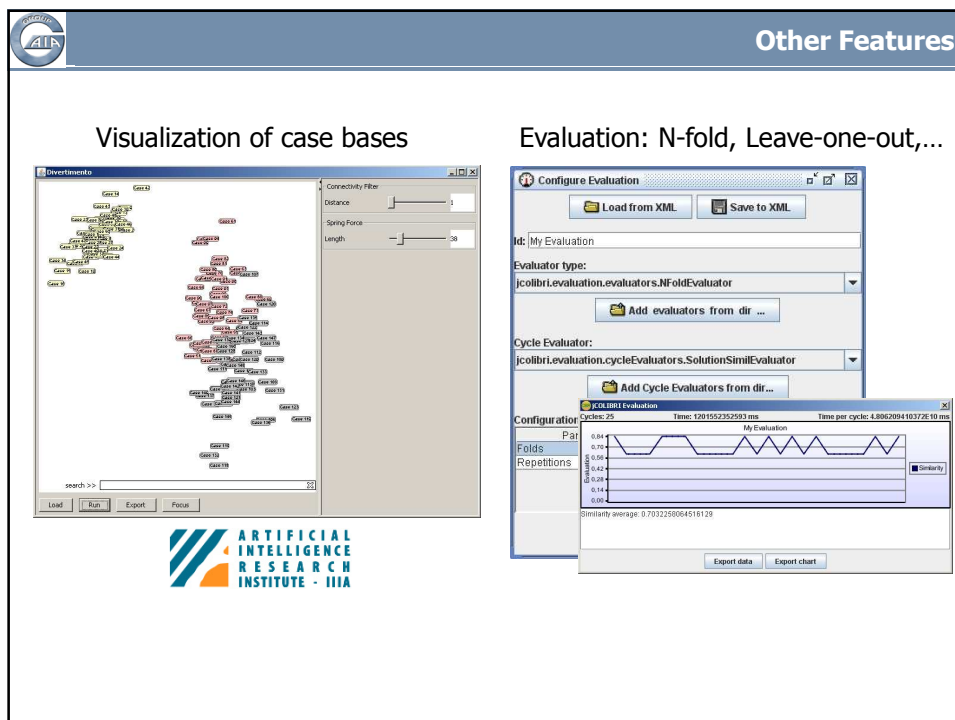
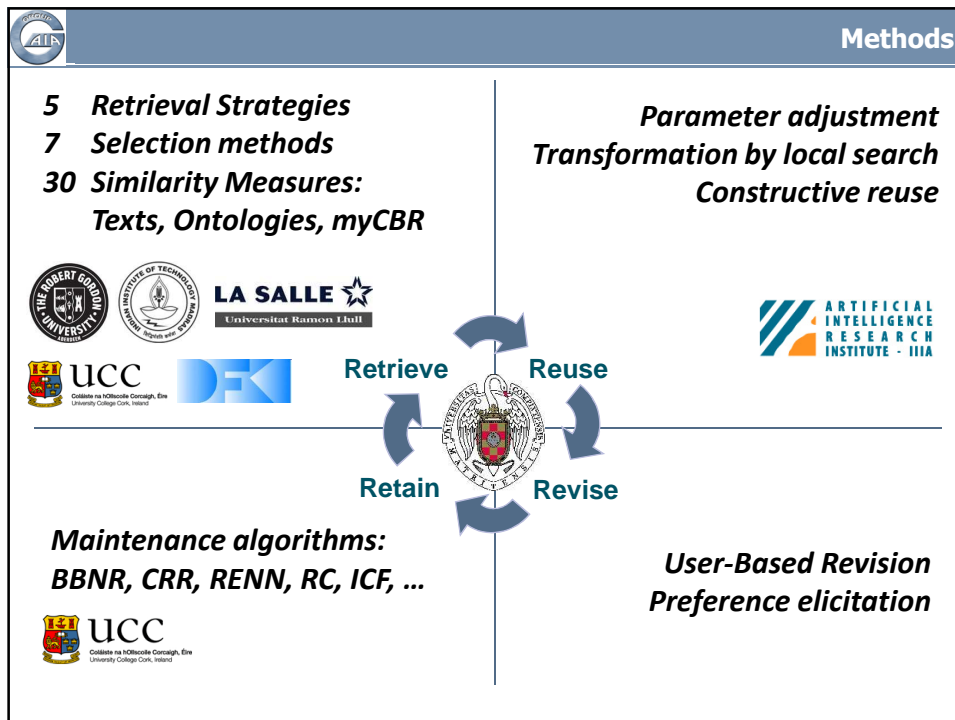
## Import jCOLIBRI2 in Eclipse

Just follow the steps described in the tutorial










**How to continue...**

<http://www.jcolibri.net>





**jCOLIBRI2 Tutorial**

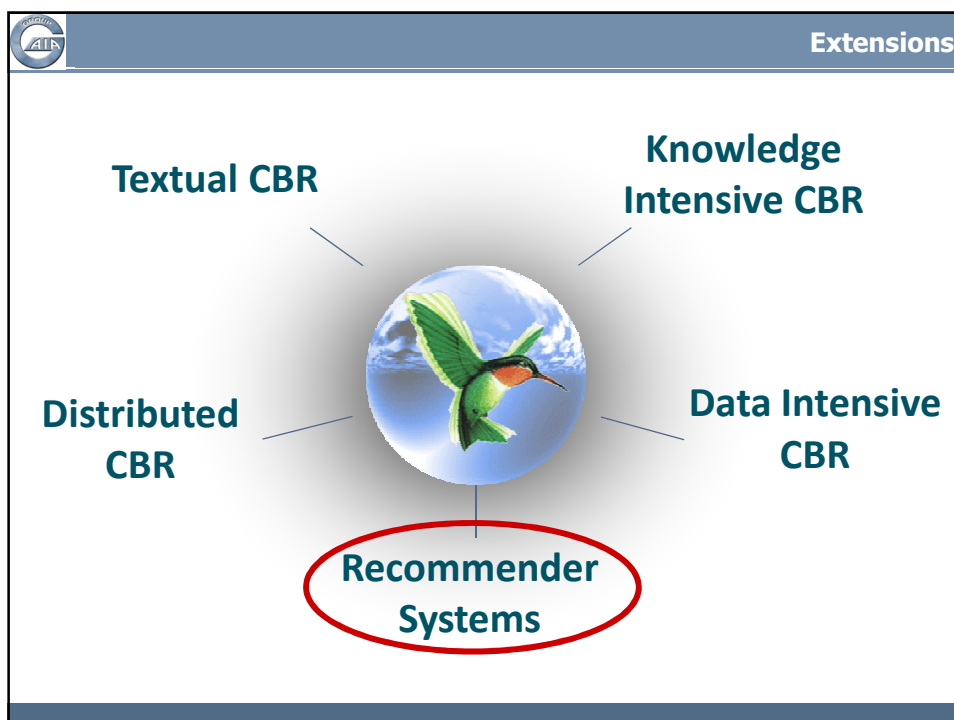
Juan A. Recio-García  
Belén Díaz-Agudo  
Pedro González-Calero

September 18, 2007  
Document version 0.90

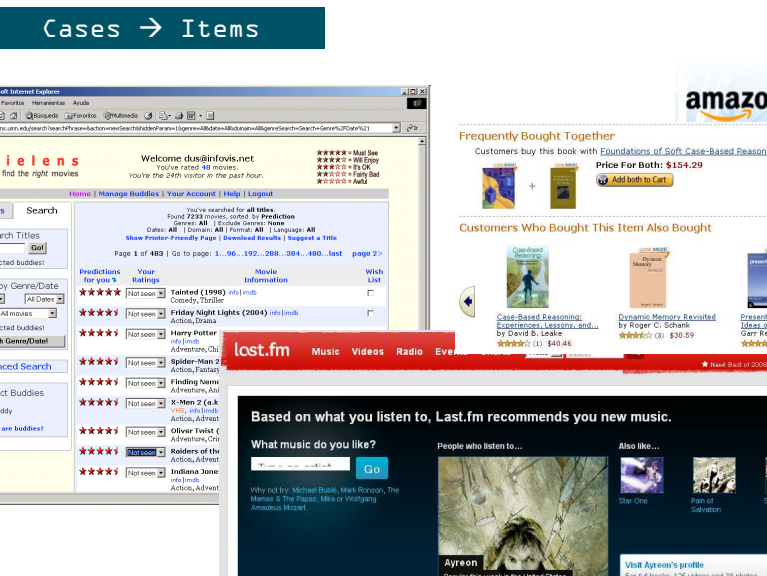


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# Recommender systems: Example



**Cases → Items**

**amazon.com**

**Frequently Bought Together**  
Customers buy this book with **Foundations of Soft Case-Based Reasoning (Wiley Series on I**  
**Price For both: \$154.29**  
**Add both to Cart**

**Customers Who Bought This Item Also Bought**

**last.fm** Music Videos Radio Evi...

**Based on what you listen to, Last.fm recommends you new music.**

**What music do you like?**

Why not try: Michael Bask, Mark Ronson, The Maroon 5, The Roots, Mica or Volfgang Amadeus Mozart

**People who listen to...**

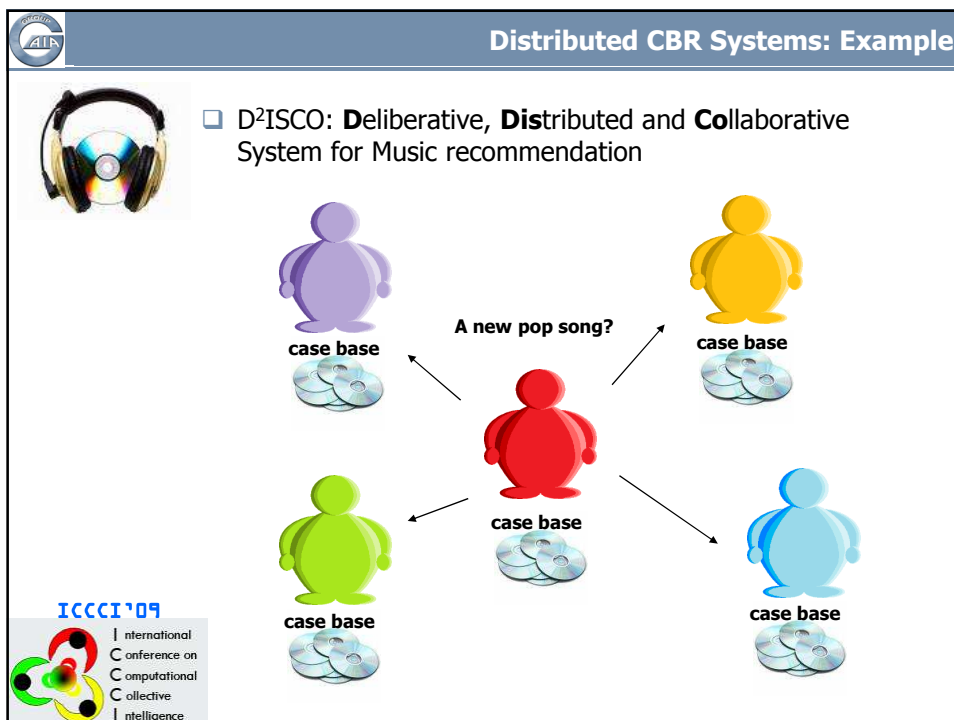
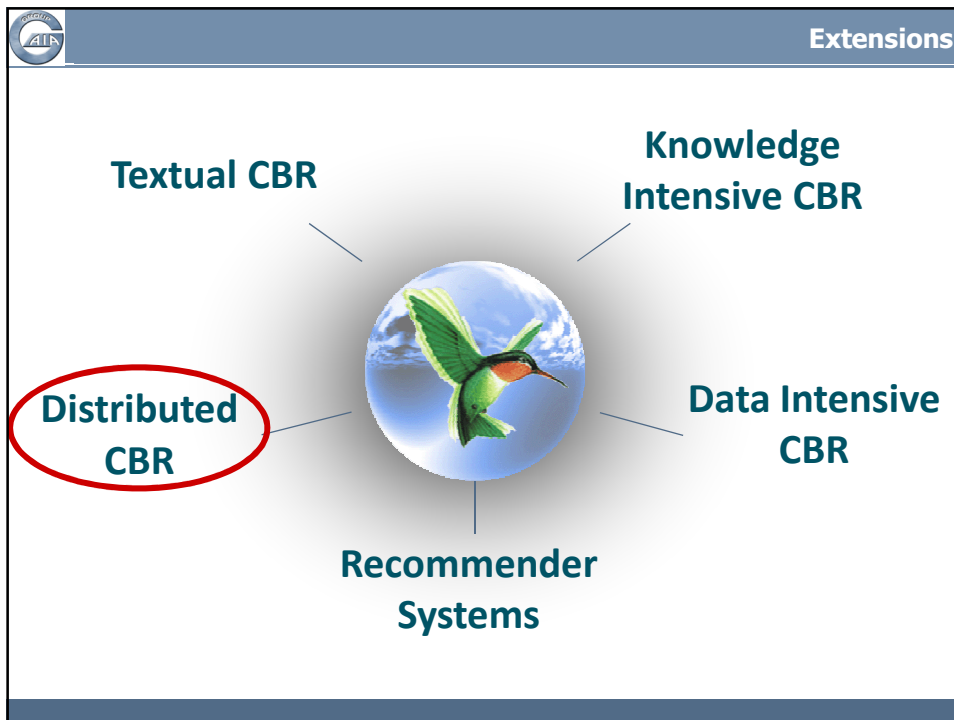
**Also like...**

**Ayreon**  
Popular this week in the United States

**Visit Ayreon's profile**  
For full tracks, 125 videos and 38 photos

Full navigation bar: All, Rock, Indie, Electronic, Pop, Metal, Hip-hop, Jazz, Classical, Country







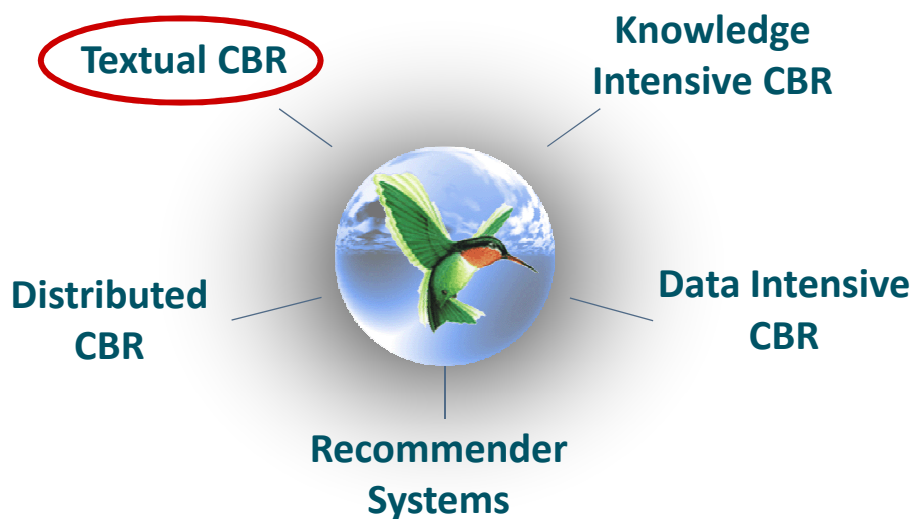
### ALADIN: Abstract Layer for Distributed CBR

- ☐ Main interfaces required to build (almost) any distributed CBR system.
- ☐ Follows the IEEE FIPA standard for distributed systems.
- ☐ Can be implemented using different technologies:
  - ☐ Sockets, JADE, ...



### SALADIN: Sockets based implementation of ALADIN

- ☐ Completely functional implementation of the ALADIN architecture



## Textual CBR: examples

**jCOLIBRI Chef Recommendation**

Query: Italian restaurant

Result:

Restaurant: Carlo's Gardel

Address: 7963 Melrose Ave.

Description: The most famous dish here must be the baked-garlic appetizer, a naked halved bulb o n a plate, ready to smear onto the house's quite decent bread. There's also melted pr ovoline cheese, laced with tomatoes and p ungent Mexican oregano, for eating with t he almost Vermont-style Argentine cracker s in the bread baskets, and an appetizer of butter-smooth roasted red peppers brush ed with garlic and oil. The fried squid are th e tender, delicate kind, hardly crunchy, tas

Challenge 1.0 - GAIA http://gaia.fiducius.es

engine failure

Case ID	Similarity
0.707	
0.699	
0.634	
0.5	
0.486	
0.458	
0.453	
0.443	
0.443	
0.416	
0.416	
0.386	
0.382	
0.336	
0.333	
0.352	
0.21	
0.178	
0.149	

Transportation Safety Board of Canada / Bureau de la sécurité des transports du Canada

Canada

Francis Contact Us Help Search Canada Site

TSB Home Media Room Statistics Reports What's New

Marine Pipeline Rail Air Site Map

Air 2001

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report

Power Loss - No. 2 Engine

Skyservice Airlines Inc.

Airbus A330-300 C-FBUS

Columbo, St. Louis

15 February 2001

Report Number A01F0020

Print View

ICCIBR 2007

CASE-BASED REASONING

DELTA

Home / Search / Help / Contact

**Case Anomaly Matching**

## Textual CBR: Semantic methods

**CBR - Textual CBR**

- CBR Task
  - Retrieve Task
    - Obtain cases task
    - Cases IR task
      - Keyword Layer
        - Words Filter
        - Stemmer
        - Part of Speech
        - Extract Names
      - Phrase Layer
      - Thesaurus Layer
      - Glossary Layer
      - Feature Value Layer
      - Domain Structure Layer
      - Information Extraction Layer
    - Compute similarity task
    - Select best task
  - Reuse Task
  - Revise Task
  - Retain Task

Follow the **Lenz layered model** and includes two implementations that use **OpenNLP** and **GATE**

ICCIBR'05





## Textual CBR: Statistical methods



- Good results in complex domains where the knowledge required to extract the information is not available



TCBR Workshop

Challenge:  
Air Investigation Reports



carrot<sup>2</sup>

open source framework for building search clustering engines



## Statistical TCBR Application: Guided Adaptation

1st - Select the section

4th - Choose one cluster

3rd - make a query

5th - Choose one document of the cluster

2nd - Edit the section text

6th - Edit and copy the needed text into the adapted document

The screenshot shows the Challenger 1.0 - GAIA application interface. It includes a 'Document Structure' pane on the left with a tree view containing 'Summary', 'Other Factual Information', 'Analysis', 'Findings as to Causes and Contributing Factors', 'Findings as to Risk', and 'Safety Action Taken'. The 'Search' pane shows results for 'weather rain snow freezing'. The 'Document Relations' pane shows a table with clusters: 'Main Rotor (4)', 'Hydroplaning Can Occur (3)', 'Elevator Trim (2)', 'At 5 (2)', and '(Other) (1)'. The 'Document Edition' pane shows a text editor with a document about a snow storm in Sydney. The 'Related Section' pane shows a document about weather observations at Peterborough airport.

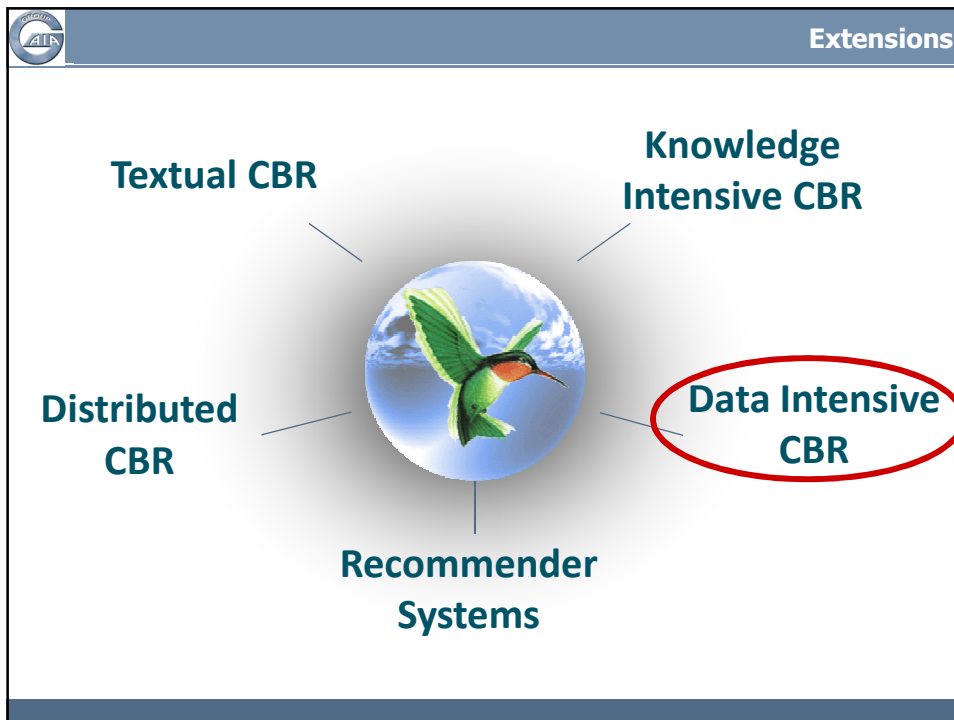


carrot<sup>2</sup>

open source framework for building search clustering engines





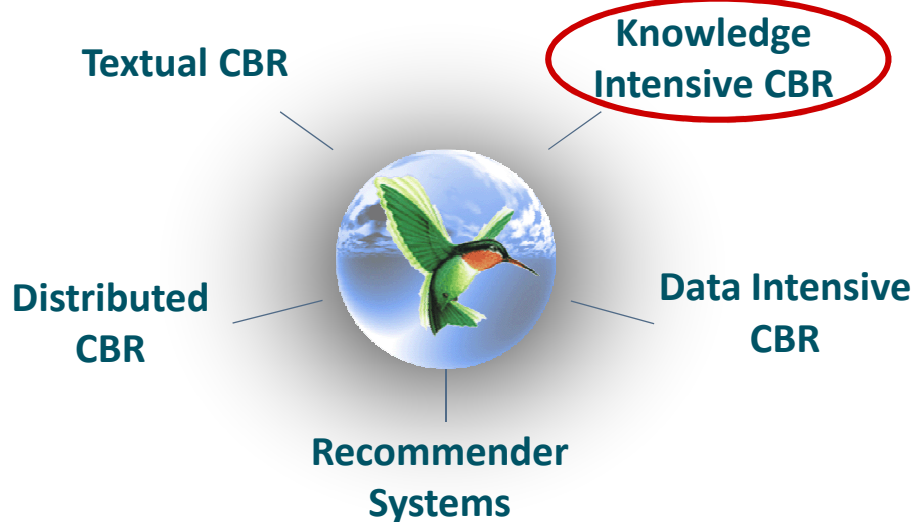
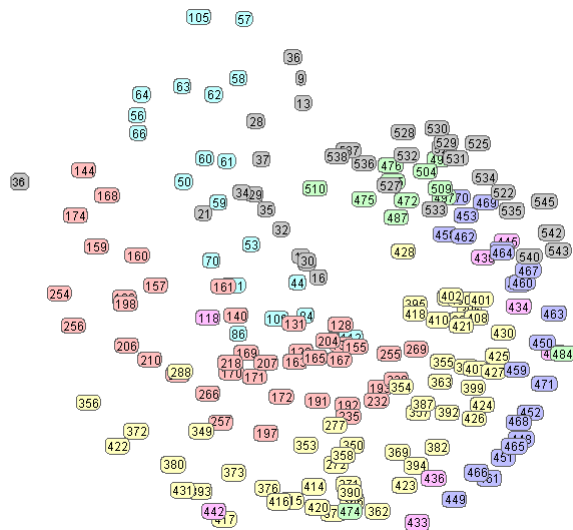


Data Intensive CBR: example

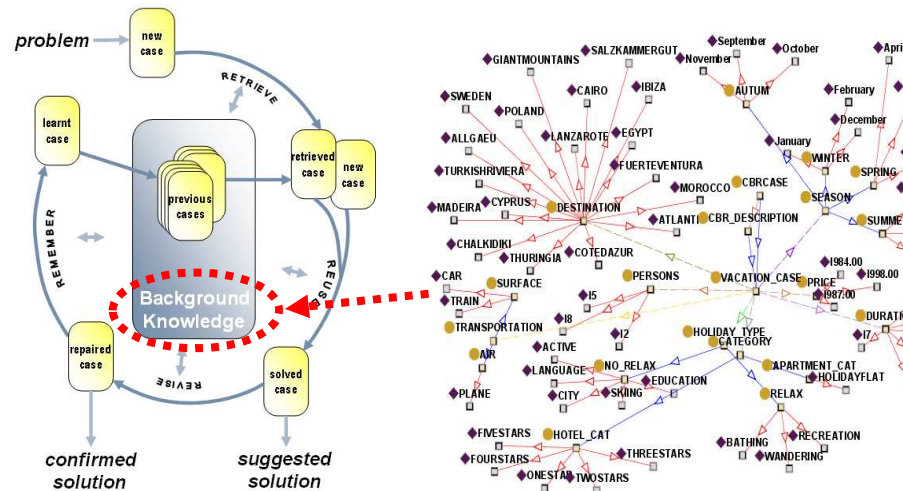
- ❑ Textual CBR application using texts from journals
- ❑ 1.500 documents / 20 categories

Huge case bases with uncertain/incomplete

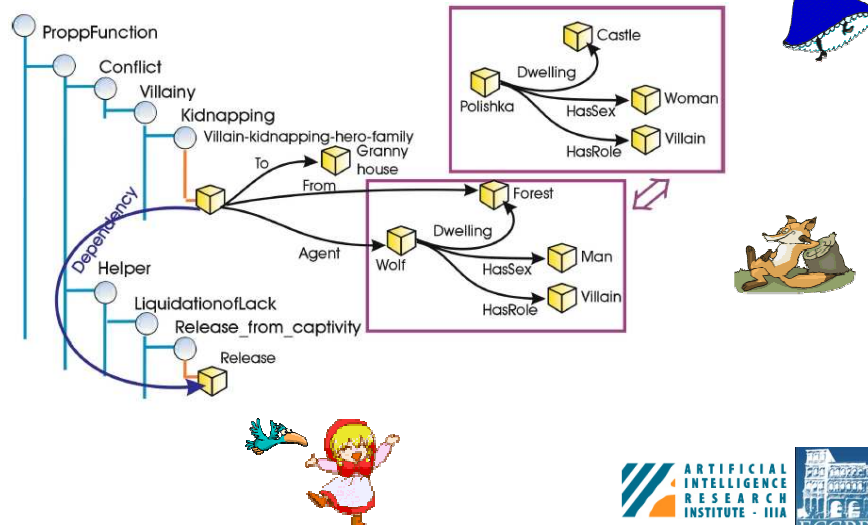
Use a clustering method to organize the case base



## Complement the knowledge required by CBR applications by means of ontologies



## Tale generator





jCOLIBRI2



# jCOLIBRI2

Case-Based Reasoning Framework

**Needs graphical tools ...**



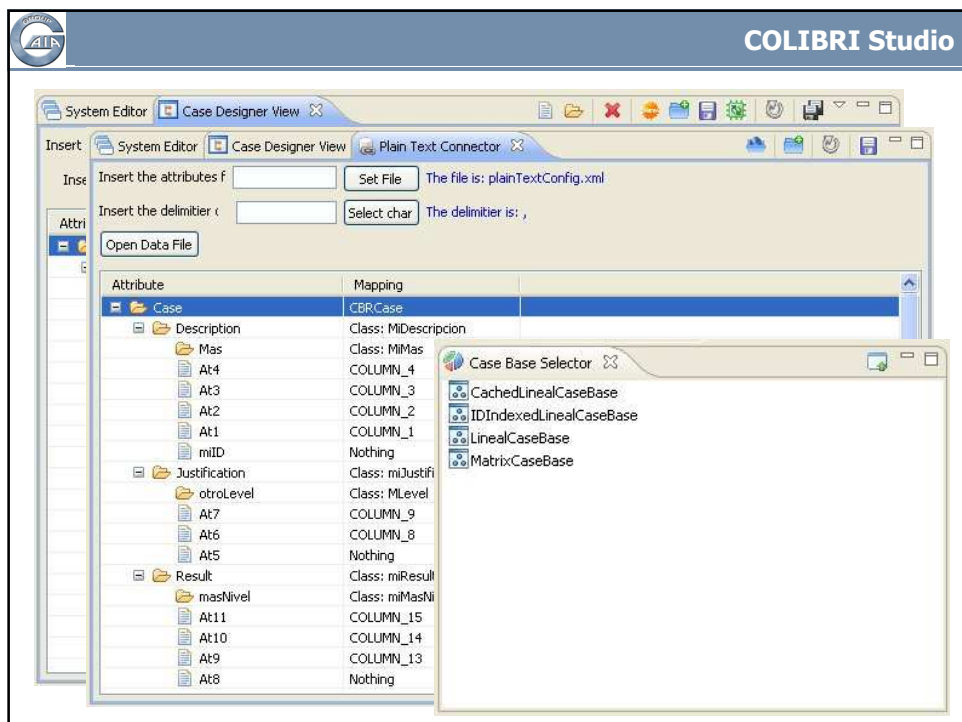
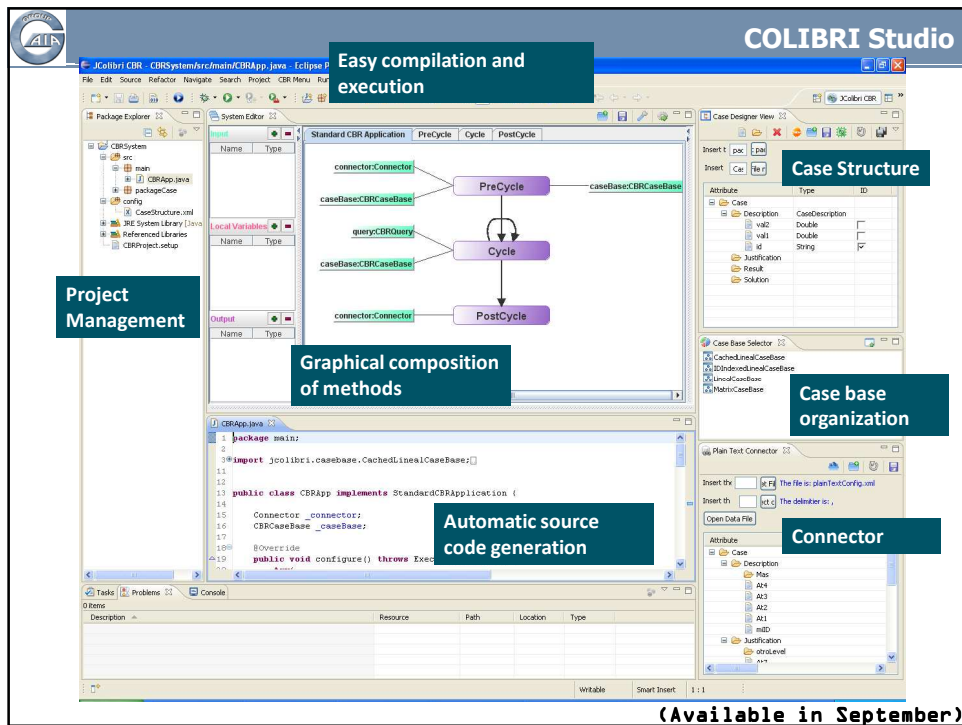
COLIBRI Studio


1st Public Presentation  
ICCBR 10



COLIBRI  
Studio  
version Beta 1

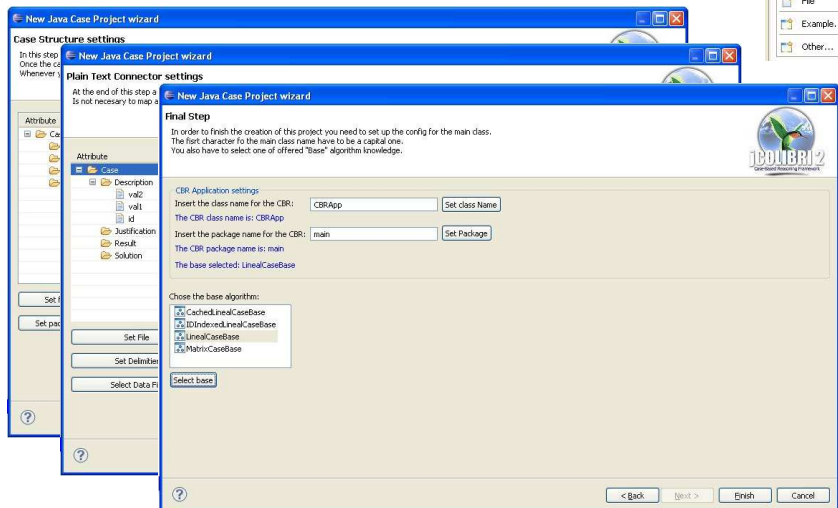
- ❑ Complete Graphical Development Environment for CBR applications
- ❑ GUI for jCOLIBRI2 integrated into Eclipse IDE






Wizard

☐ Easy to follow wizard to configure the basic building blocks of CBR applications



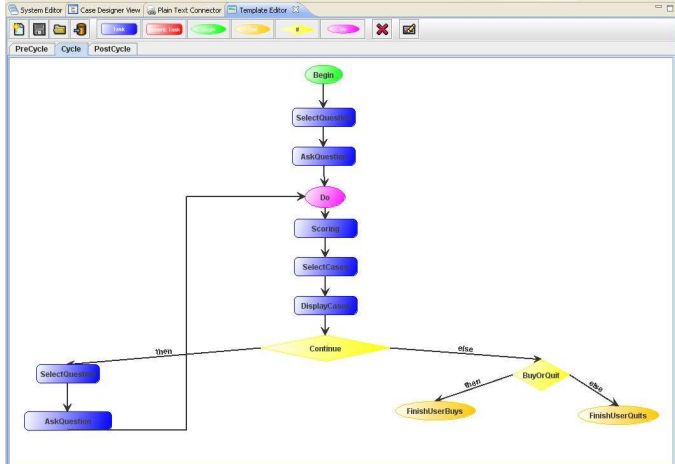



COLIBRI Studio

- ☐ Graphical configuration of the CBR system through templates.
- ☐ Templates are abstract representations of common CBR applications that can be customized.
- ☐ COLIBRI Studio will provide templates for standard CBR systems, Textual CBR applications and recommenders.

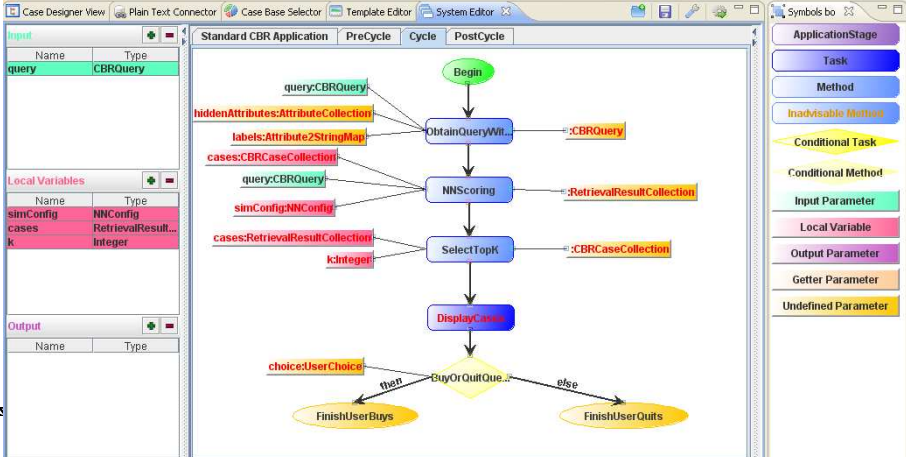
**CBR for CBR: A Case-Based Template Recommender System for Building Case-Based Systems. ECCBR06, 2006**


**Semantic Templates for Case-Based Reasoning Systems (2009), in: The Knowledge Engineering Review, 24:Special Issue 03, 2009**





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**COLIBRI Studio**



version Beta 1

Coming soon at [www.jcolibri.net](http://www.jcolibri.net)





Questions?



<http://www.jcolibri.>

Juan A. Recio-García

