

Case-Agents: a novel architecture for case-based agents

Assoc. Prof Ian Watson
 Dept. of Computer Science
 University of Auckland
 New Zealand

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Motivation

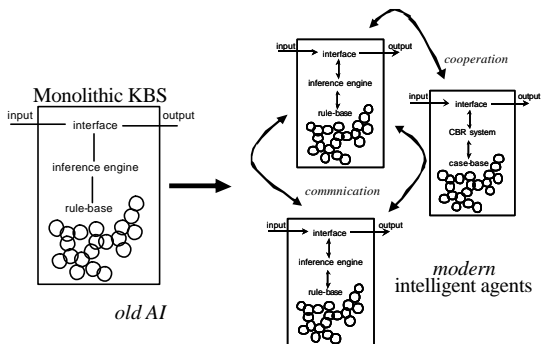
- This research started from a thought exercise
 - what if.....?
- The paper doesn't present an implementation or results
 - I will present some initial findings
- Intended to stimulate people to ask what if....?

CBR & agents

- *"intelligent agents are both a distant and unnecessary goal"*

Chris Reisbeck, *"What next? The future of case-based reasoning in post-modern AI"* in *Case-Based Reasoning: Experiences, Lessons & Future Directions*. Leake, D.B. (Ed.). AAAI Press / MIT Press, pp.371-388

Agents add complexity without necessarily improving performance

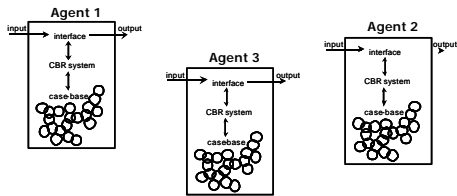


CBR & agents

- Given the popularity of CBR & agents from the mid 1990's onwards it's surprising there hasn't been more CBR-agent work
- One reviewer said *"there are roughly only ~20-25 publications relevant to this topic..."*
 - Enric Plaza's group
 - Katia Sycara's group
 - Robin Burke

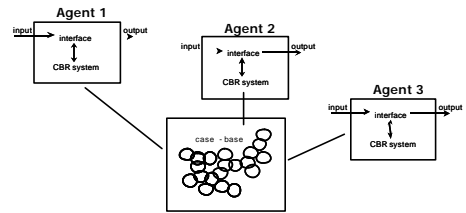
CBR agent architectures

- Internal-case agents
 - Each agent has its own case-base



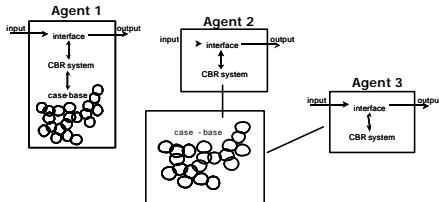
CBR agent architectures

- External-case agents
 - Agents share external case-base(s)



CBR agent architectures

- Intra-case agents
 - Both inter- & extra-cases in one system



What if.....

- Each case was an agent?

What if.....

- Each case was an agent?
 - What would this architecture look like?
 - How would it work?
 - Would there be any benefits?
 - Would there be any drawbacks?
 - What sort of problems would be suited?

Case-agents

- Case-representation
 - Basic division of a case into
 - problem description:solution description*
 - Structural representations could also be supported
 - But cases with different internal representations could co-exist in the same system
 - Providing each case-agent has a similar interface
 - No real change here then

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Case-agents

- Case Retrieval
 - Each case is responsible for assessing its similarity to Target/Query cases
 - Cases can use different similarity metrics
 - Truly local similarity
 - This is different
 - Perhaps "better" retrieval
 - Greater complexity, inefficient, danger of over-fitting

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Case-agents - retrieval

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Case-agents - retrieval

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Case-agents

- Reuse
 - Once cases have determined they are similar to a target
 - They present their solutions to a broker-agent
 - The broker agent could determine the best/cheapest/easiest to adapt solution from those on offer
 - Cases could adapt their own solutions or there may be adaptation-agents (not necessarily case-based)

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Case-agents

- Retention
 - Once a new case was created a new agent would be created
 - Need to decide on similarity metrics
 - Perhaps same as agent that created the new case
 - Once a new case-agent was created it would interact with the existing case agents
 - Triggering a maintenance cycle

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Case-agents

- Maintenance
 - New Case
 - Diagram showing a new case agent C6 (white circle) being added to the existing set of case agents (C1, C2, C3, C4, C5). C6 is connected to C1, C2, and C3. A label 'Case-agent similarity neighbourhood' points to the area around C2.

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Case-agents

- Maintenance
 - Interesting dynamic self-organizing behavior possible
- The *lonely* case-agent
 - Never sees any other cases or target problems
 - Programmed to kill or archive itself

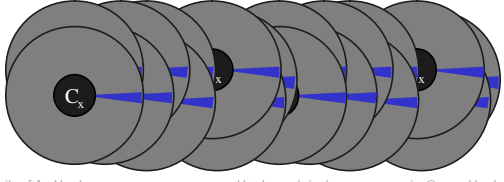


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Case-agents

- Maintenance
 - *overcrowded* case-agents
 - Negotiate to prune themselves
 - Use competence models (Smyth et al)

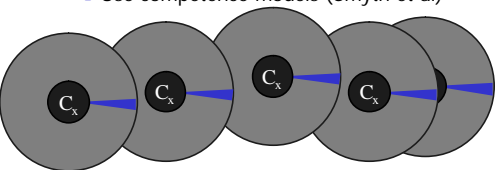


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Case-agents

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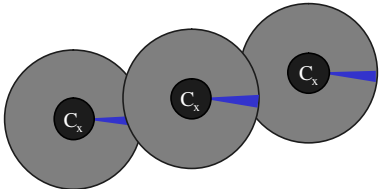


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Case-agents

- Maintenance
 - *sparse* case-agents
 - Negotiate fill competence holes (Smyth et al)



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Case-agents

- Maintenance
 - case-agent tuning
 - Agents could tune their similarity metrics and adaptation methods with respect to their neighbours
 - and their success in having brokers choose their solutions
 - Case-agents are competitive
 - Populations of case-agents
 - Evolutionary case-agents ????

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Case-agents

- travel case-base
 - Different similarity metrics across ~1100 agents
 - The case-agents are aware of time
 - As their holiday's commencement date approaches they:
 - reduce their similarity threshold
 - discount their price
 - If their date expires they expire

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Thank You

Questions?