Case-based reasoning is a methodology not a technology

—— Ian Watson

Presented by Chen WANG
• Case-based reasoning

• CBR applications:
  ◦ CBR using nearest neighbour
  ◦ CBR using induction
  ◦ CBR using fuzzy logic
  ◦ CBR using database technology

• Conclusion
Case-based reasoning

“A case-based reasoner solves problems by using or adapting solutions to old problems.”

(Riesbeck and Schank)

* It is “what”, not “how”
CBR-cycle

1. **Retrieve** similar cases to the problem description.
2. **Reuse** a solution suggested by a similar case.
3. **Revise** or adapt that solution to better fit the new problem if necessary.
4. **Retain** the new solution once it has been confirmed or validated.
Methodology

“an organised set of principles which guide action in trying to ‘manage’ (in the broad sense) real-world problem situations.”

(Peter Checkland)
CBR using nearest neighbour

\[ \text{Similarity}(T, S) = \sum_{i=1}^{n} f(T_i, S_i) \times w_i \]

T – the target case
S – the source case
n – number of attributes in each case
i – an individual attribute from 1 to n
f – a similarity function for attribute i in cases T and S
w – the importance weighting of attribute i

Application:

Wayland—setting up aluminium die-casting machines
CBR using induction

It is assumed (usually correctly) that cases with similar problem descriptions will refer to similar problems and hence similar solutions.

Application:

Troubleshooting CFM 56-3 engines on Boeing 737s
A fuzzy preference function is used to transform a quantifiable value for each attribute into a qualitative description of the attribute that can be compared with the qualitative description of other attributes.

Application:

*Colour matching plastics at General Electric*
Databases are efficient means of storing and retrieving large volumes of data.

• If problem descriptions could make well formed queries it would be straightforward to retrieve cases with matching descriptions.

Wild cards —— a way to get not 100% exact matched data

Application:

squad—sharing experience at NEC
CBR guiding principles

- each explicitly attempts to solve problems by reusing solutions to old problems

- the retrieval of past problems (cases) involves assessing the similarity of the problem to cases in a case-library

- once a new problem is solved it is added to the case library to retain the problem solving experience for future reuse
“A case-based reasoner solves problems by using or adapting solutions to old problems.”

(Riesbeck and Schank)

Methodology

“an organised set of principles which guide action in trying to ‘manage’ (in the broad sense) real-world problem situations.”

(Peter Checkland)
There will be more technologies added to the cycle.

![Diagram of the CBR-cycle](image)

Fig. 5. Technologies and the CBR-cycle.