EXPERIENTIAL-BASED REASONING
CASE-BASED REASONING

(Part VII – Evaluation)

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PART 7 – CBR SYSTEM EVALUATION

CBR System Evaluation

CBR system evaluation

- Technical Criteria
  - Definitional issues
  - Development issues
  - Execution issues
- Ergonomic criteria
  - Development issues
  - Execution issues

Technical criteria: definitional issues (1)

- Case representation
  - Ability to handle structured domains
  - Expressiveness
    - Kind of attributes
    - Default values
  - Missing / do not care / uncertain values
  - Negative examples
- Case library organisation
  - Kind of indexing
  - Retrieval techniques

Technical criteria: definitional issues (2)

- Assessing similarity
  - Techniques available
  - Automatic modification of the similarity measure
  - How is similarity computed between:
    - Numeric values
    - Symbol values
    - String values
  - Kind of weights
  - Knock-out attributes: filtering attributes
    - For instance, one attribute with weight equal to the sum of all other attributes
  - Use of thresholds
  - Incorporation of declarative knowledge

Technical criteria: definitional issues (3)

- Adaptation, evaluation and learning cases
  - Handling case adaptation
  - Handling case evaluation
  - Handling case learning
- Background knowledge
  - Techniques
    - Categories, weights, decision trees, rules
    - Models, prototypes, formulas, taxonomies, ordering, ontologies
  - When it is used
    - Retrieval
    - Adaptation

Technical criteria: development issues

- Supporting noisy data in the cases of the case library
- Supporting incomplete data in the cases of the case library
- Performance
  - Building speed for application development
- Consistency
  - Independence of order of the input cases
- Effectiveness
  - Input data minimisation
  - Cost functions
  - System optimisations over time
- Adaptability
  - Explicitly data generalisation
  - Automatic data purging

Technical criteria: execution issues (1)

- Supporting noisy data in the new cases
- Supporting incomplete data in the new cases
- Flexibility
  - Different modes of consultation
  - Ability to correct previous input case
- Performance
  - Competence
  - Efficiency
    - Retrieval time
    - Memory / disk space consumption

Technical criteria: execution issues (2)

- Correctness
  - Testing of identical cases
  - Testing of similar but not identical cases
  - Testing several similarity measures
  - Integration of techniques to improve the case retrieval
    - Derivation of additional features
    - Change/select the order of attribute consultation
    - Change the missing values handling
- Completeness
  - Coping with the complete domain of application
  - Easiness to detect non solvable new cases

Technical criteria: execution issues (3)

- Consistency
  - Stability over time (same output when using same input)
  - Sensitivity to the order of input cases
- Effectiveness
  - Optimisation of order/number of interactions (effective index learning)
  - Optimisation of correctness over time (effective case learning)

Ergonomic criteria: development issues

- Control of application development
  - Incorporation of background knowledge
  - Degree of domain expert control over the application complexity
- Validation and testing
  - Automatic / manual facilities to test and validate
- Knowledge and data acquisition / maintenance
  - Coping with domains with frequent updates (incremental operation)
  - Supporting automatic long-term optimisation

Ergonomic criteria: execution issues (1)

- User acceptance
  - Explainability and modelling support
    - Self-generation of explanations
      - Decisions, conclusions, features
    - Good documentation
    - On-line help
    - Domain modelling through knowledge integration
  - Comprehensibility (logical flow reasoning)
  - User interface
    - User friendly
    - Customisation of the user interface
    - Supporting different kinds of user
    - Supporting additional multimedia data
    - Improving users' motivation and acceptance

Ergonomic criteria: execution issues (2)

- Organisational and human impacts of the technology
  - Appealing to capture experience preventing from a loss of *know how*
  - Easiness of domain experts training
  - Easiness of user training
- Outside world interface
  - Import / export data facilities
    - Data bases
    - ASCII/XML files
    - Shared multi-user access
  - Communication with other programs (APIs)

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