Case-based Reasoning in Health Care
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Introduction
- Resembles human reasoning

Limitations
- Not well-suited for some medical applications.
- Case representation
- Case Retrieval
- Adaptation problem
Multi-modal reasoning

- Combination of different Artificial Intelligence techniques
- Case representation
  - Feature mining
- Adaptation
  - Avoid adaptation step
  - Multi-modal reasoning

Fuzzy CBR

- Case Retrieval
  - Quality of the case library
  - Multi-modal reasoning
- Fuzziness/uncertainty is encountered
  - Combine Soft computing in CBR
  - Several aspects that motivates use of fuzzy with CBR
  - Uncertainty
  - Similarity

Limitations

- Computation is still not used in real applications—feel unconfident.
  - Lack of information for making cases.
  - Development of new technologies. The case library updated and integrated with new findings.
  - The result evaluation is still depend on the physicians.

Fuzzy CBR

Figure: general structure of the fuzzy CBR
Fuzzy CBR

- Relevant data is transformed into fuzzy terms based on the data types.
- Data type can be classified into the following types, such as Text value, Single value, A range, and Linguistic value for indexing.
- When the new case enters the system, the matching process is taking place.

Fuzzy similarity

- Fuzzy CBR makes the similarities graded so that the similarities of attributes between new and old cases can be fuzzy numbers like '0.8, 0.4, 0.2' instead of boolean matching values in the traditional CBR.

Fig: Calculating the intersection area between two membership

Fuzzy Terms

- First step in the process of matching two facts is the transformation of the relevant data into fuzzy terms.
  - Text value
  - A range

Fuzzy Terms

- Single value
- Linguistic value

Clustering

- It divides a given data into a set of classes or clusters.
- Two cases from the same cluster are as similar as possible and two cases from different clusters are as dissimilar as possible.

Hierarchical Methods, Partitioning Relocation Methods, Grid-Based Methods, and other clustering techniques...
Decision Support System

- Outlined a methodology combining the CBR and Fuzzification in stress medicine.

Stress measurement

Post Traumatic Stress Disorders
Stress measurement

A student before his thesis presentation

Stress measurement

Stress measurement

Stress measurement
Decision Support System

- Data preprocessing is important
- Fuzzification
- Clustering
- Case-based Reasoning

Parameters are set by the clinician based on experience and feedback from the persons and stored in the person’s case

This is a “New Calibration Case”

new case can be used in a variety of situations, e.g. to assess the effect of treatment and recovery or to identify dangerous stress levels

Biofeedback

Biofeedback is a treatment technique in which people are trained to improve their health by using signals from their own bodies.

Physical therapists use biofeedback to help stroke victims regain movement in paralyzed muscles.

Psychologists use it to help tense and anxious clients learn to relax.

The combination of fuzzy set theory and CBR systems supports two different tasks:
1) defining classes for indicating the levels of stress
2) Selection of the matching cases from the previous experience.

Case retrieval is made using a similarity measure based on these membership functions.

The proposed system consists of 6 steps: calibration, pre-processing including fuzzification, retrieval, reuse, revise and retain.
Bio-feedback

- "see" or "hear" activity inside their bodies.
- One commonly used type of machine, for example, picks up electrical signals in the muscles. It translates these signals into a form that patients can detect: It triggers a flashing light bulb, perhaps, or activates a beeper every time muscles grow more tense. If patients want to relax tense muscles, they try to slow down the flashing or beeping.

Most patients who benefit from biofeedback are trained to relax and modify their behavior.

Bio-feedback

- They must recognize that they can, by their own efforts.

Meditation

Meditation is a useful and practical technique for managing stress.
Qi-Gong

"Qi Gong" (literally "breath exercise")
Qigong exercise requires one to relax, to be calm, natural and free from distractions, so that it can remove "stress," and dispel tension.