An Overview of CADIAG-4: A Medical Diagnostic and Therapeutic Consultation System

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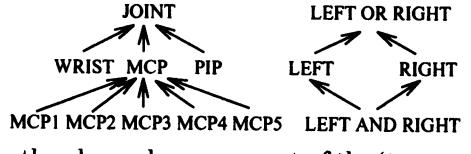
INTRODUCTION

CADIAG-4, the successor of CADIAG-2 [1] and CADIAG-3, has been designed as a medical diagnostic and therapeutic consultation system. The main goal of this project is the development of a medical consultation system for general internal medicine, which is intended to assist the differential diagnostic process by indicating all possible diseases which might be the cause of patient's pathological findings, with special emphasis on rare diseases. It extensively uses the formal framework of fuzzy set theory and fuzzy logic to represent uncertainty in medicine. CADIAG-4 has been completely redesigned to support several software platforms, an extended knowledge representation formalism, and an improved inference process.

METHODS

In the following we present a very short overview of the chief characteristics of CADIAG-4. As in SNOMED, we use facet systems to define the medical terms. Additionally, we introduce qualifier, whose meaning is to denote the facet items in a more specific way.



Given the above shown excerpt of the 'topography' facet system and the associated 'symmetry' qualifier system, the following example defines the symptom 'symmetrical arthritis':

```
cnt_joints = COUNT (
  wrist:left or right|swollen|...,...,
  MCP:left or right|swollen|...)
cnt_symm_joints = COUNT (
  wrist:left and right|swollen|...,...,
  MCP:left and right|swollen|...)
symmetrical arthritis = >50%
  (cnt_joints / cnt_symm_joints)
```

First we define two functions: one counts the wrists and MCPs which are affected and the other counts those which are symmetrically affected. Note that the function **>50%** probably uses a fuzzy set to generate its output. Three kinds of relationships are possible between the antecedents and the consequents of inference rules. During the knowledge acquisition phase the physician has to decide in favor of one of them: (1) positive evidence, (2) neutral evidence, and (3) negative evidence. Based on the inference process of CADIAG-3, which uses a form of the compositional rule of inference and an improved inference using a fixed-point method, we extend the inference process by (1) dealing with negative evidence, (2) using the facet and qualifier hierarchy for the inference process, (3) allowing the parameters of the implication to be fuzzy sets in themself, (4) providing the use of several operator systems to cope with the various meanings of operators like 'and' or 'or'.

RESULTS

Several studies using CADIAG-2 and CADIAG-3 in the area of rheumatology, pancreatic diseases and gallbladder and biliary tract diseases shown the usefulness of our chosen approach. The current state of the project covers the implementation of the relational database [2] the inference process and the client/server subsystem and an intermediate state in the working progress of the extension of the radiology knowledge base [3] and the GUI has been reached.

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References

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