

Medical KBS Design with Patterns

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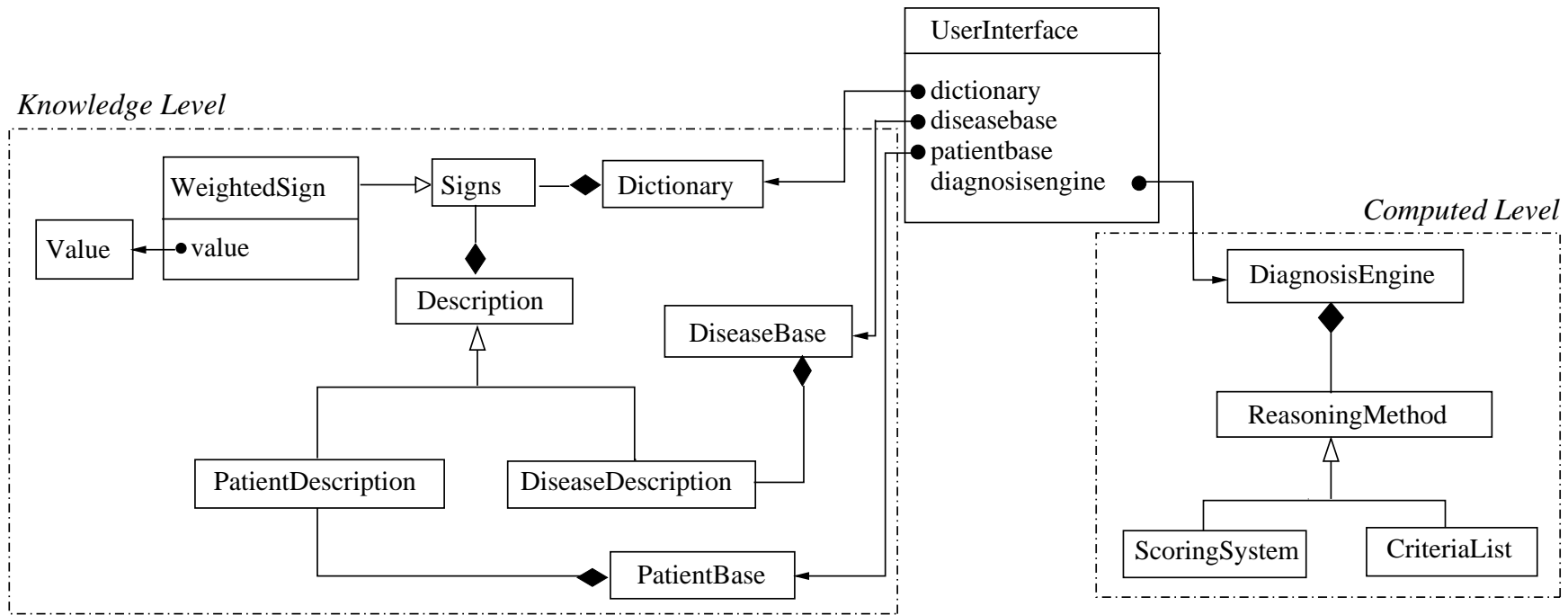
What is needed in a Diagnostic Making System ?

- A *Knowledge Base* which contains the *definitions of pathologies*.
- Modules of *reasoning* which share the Knowledge Base.
- A module of communication with the practitioner, to take into account the *patient description*.

In this context, these different points will be presented:

- Object-Oriented Design for a Clinical Diagnostic System.
- Introduction of Patterns in the model.
- Software Engineering and Artificial Intelligence.

Object Architecture of the Medical KBS



Adding Patterns to the Model

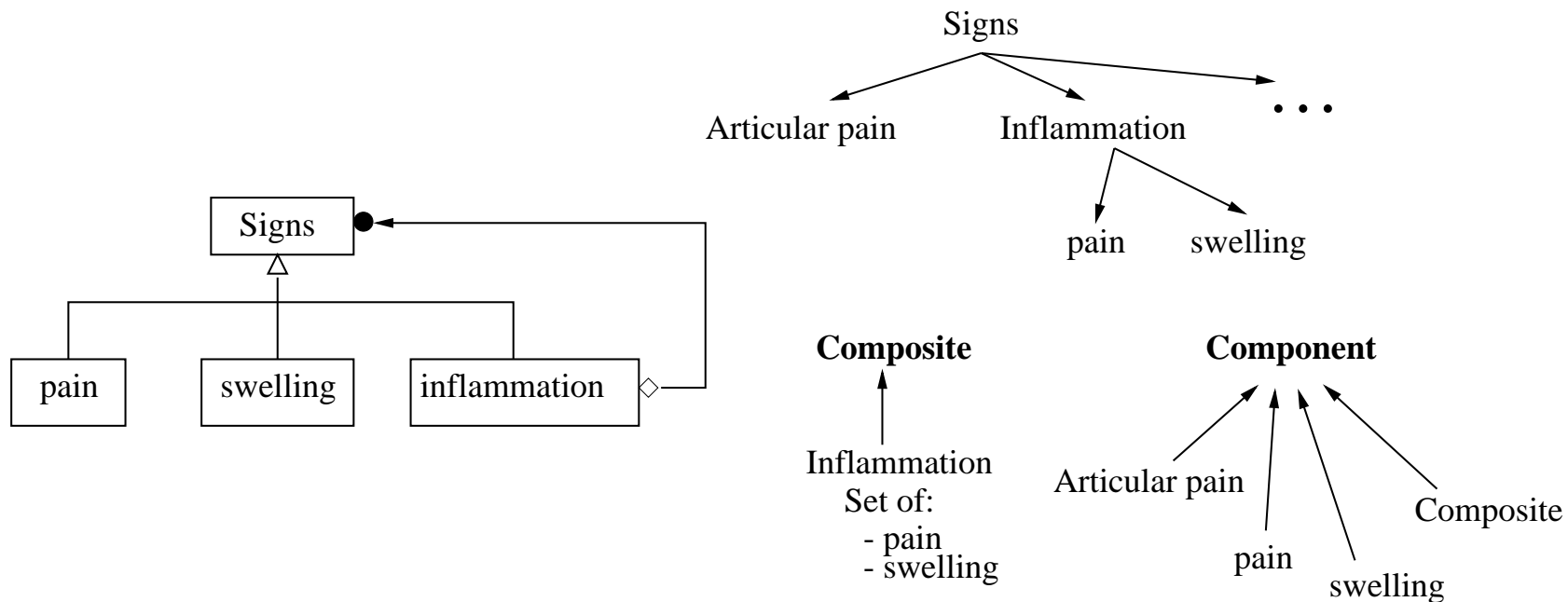
Patterns modelize *objects which do not exist as full entities in a human cognitive system.*

Four patterns have been chosen to complete the first model:

- **Composite** and **Strategy**: to help structuring the knowledge with definitions of common behaviours of objects.
- **State**: to improve the semantic representation of the knowledge.
- **Iterator**: to identify generic mechanisms hidden into several procedures.

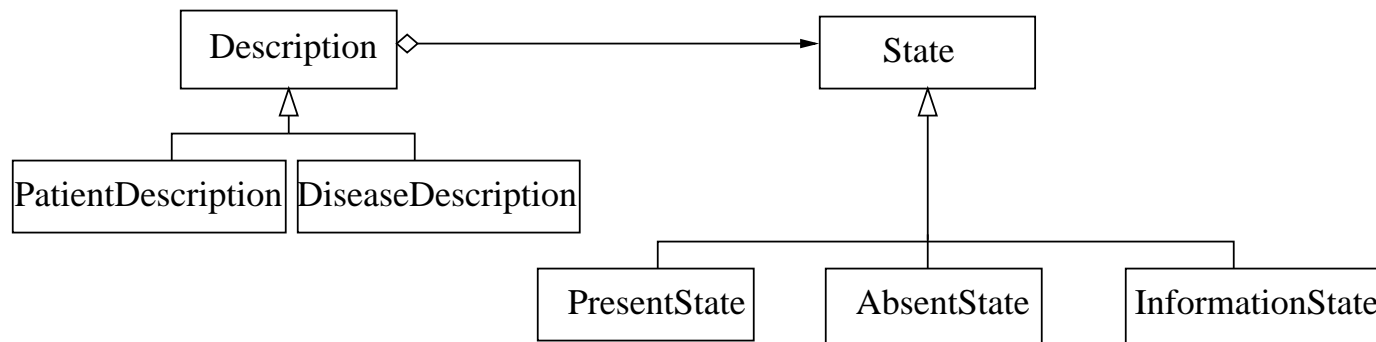
Composition of Signs

The first problem in clinical medicine is to model in the same way pathologies which have *heterogeneous signs*.



Interpretation of Signs

- The expression of the weight of a sign into the diagnosis is linked to the method of reasoning.
- Each of them has its own type of values but we want to share some information such as: *“the presence of articular pain is significant, the absence of destruction is very significant”*.
- The pattern **State** is used in order to save the information of *“presence”* or *“absence”* without taking into account which treatment is done.
- Three States are defined : *present*, *absent* and *information*.



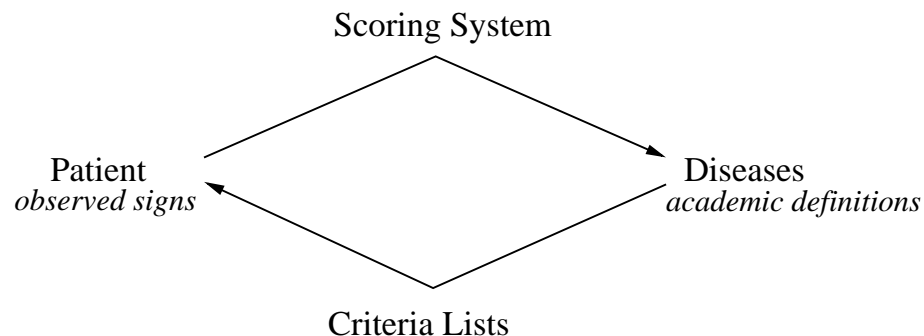
Structuring of the Treatment Modules

The main purpose of a diagnostic system is the *comparison* between the *patient* and the *disease description*:

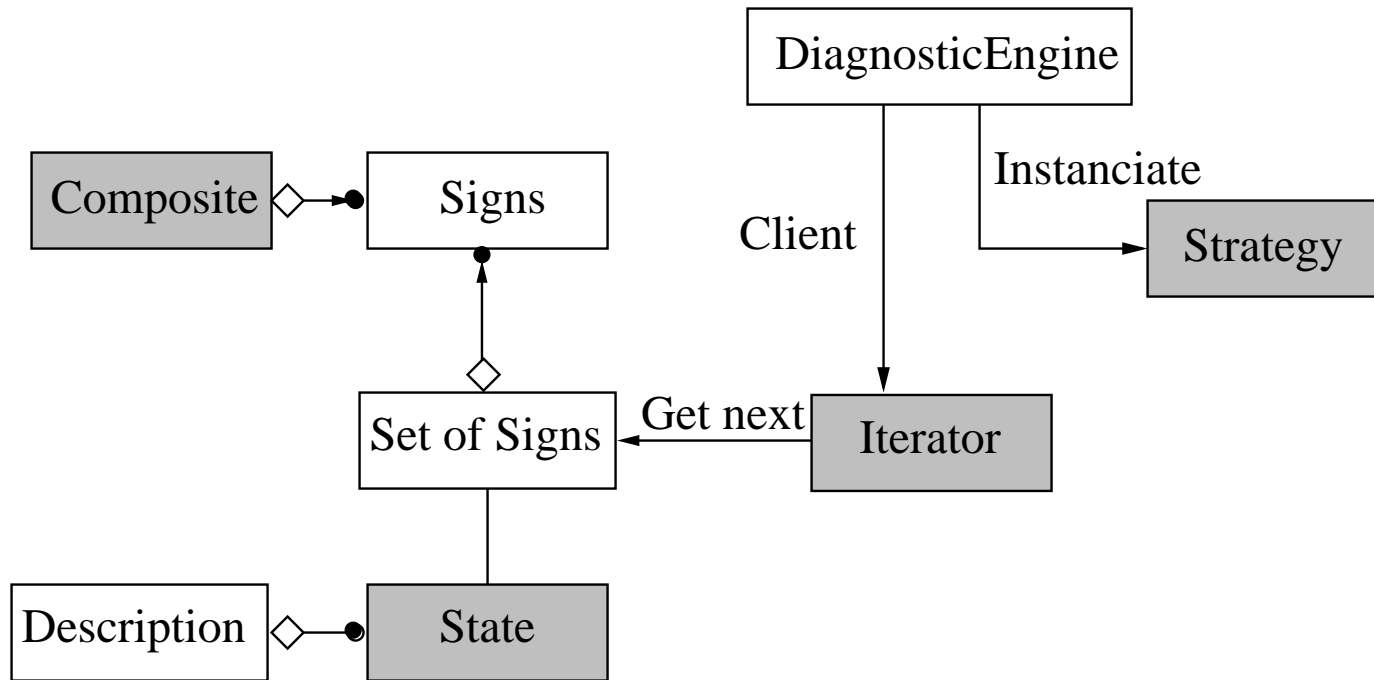
- does the patient have the signs included in diseases descriptions or not?

The diagnostic process is split into 2 stages :

- A generic diagnostic task for running through two sets of signs (disease and patient) with an **Iterator**.
- A common interface for the specific modules of computing with **Strategy**

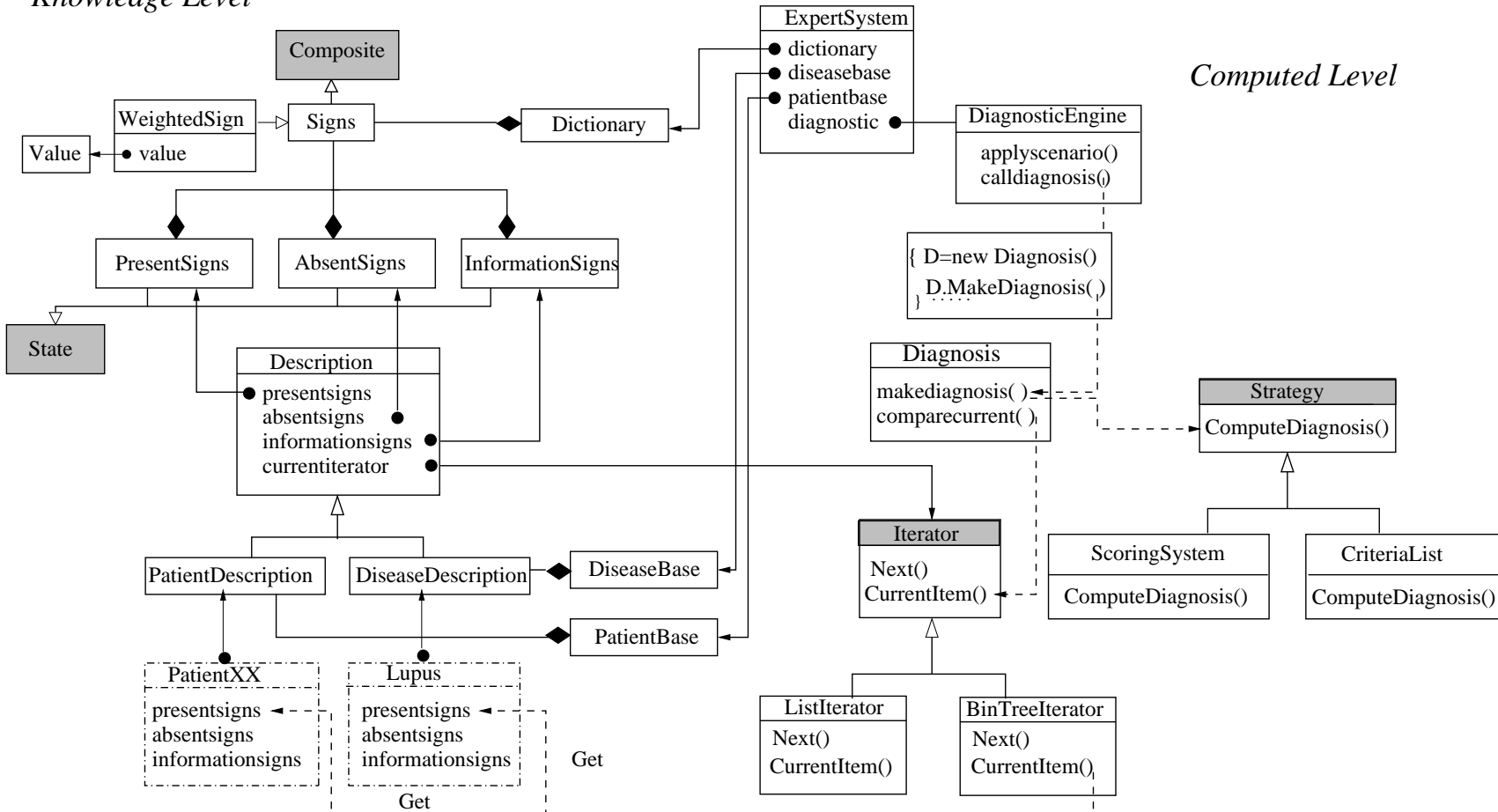


Architecture including Patterns



Knowledge Level

Computed Level



Software Engineering and Artificial Intelligence

- Intelligent Systems are often *organized around one method of reasoning* and the whole architecture is influenced by this point of view:
 - decision trees, rule based systems, semantic networks . . .
- In this work, we have *coupled a traditional representation of the concepts* of medical data, with *specific objets required by software design*.
- The patterns *modelize some semantic concepts* in the knowledge base, in addition to improve the quality of software programming.