

Faculteit Wiskunde en Informatica
Vrije Universiteit, Amsterdam
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Exam part II Knowledge-based Systems

Wednesday, 5th of June, 13.45-15.30

name:

student number:

Assessment:

Exercise 1	Exercise 2	Exercise 3	Exercise 4	Exercise 5	extra
10 +8	10	18	16 + 8	8 +12	10

Exercise 1: Introduction

- a. There are several types of knowledge intensive tasks. What is the difference between *analytic tasks* and *synthetic* or *constructive tasks*? Give an example of both.
- b. Which are the economic advantages of the application of a configuration system for a company that produces consumer electronics (TV sets, CD players, etc)?

Exercise 2: Legal Knowledge-based Systems

Explain the difference between *rule-based reasoning* and *case-based reasoning*.

Exercise 3: Classification

Consider the following classification scheme. First, raw data (R_i) is combined by means of the logic operators $\wedge$ (and) $\vee$ (or) and $\neg$ (not). This produces abstract data (D_i), which is subsequently used for hierarchical classification into distinct solution classes (S_i).

Indicate for each of the following data vectors, which solution classes are *consistent*, which *match* and which are *inconsistent* with the data.

a. $R = (1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0)$

b. $R = (0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 1 \ 0)$

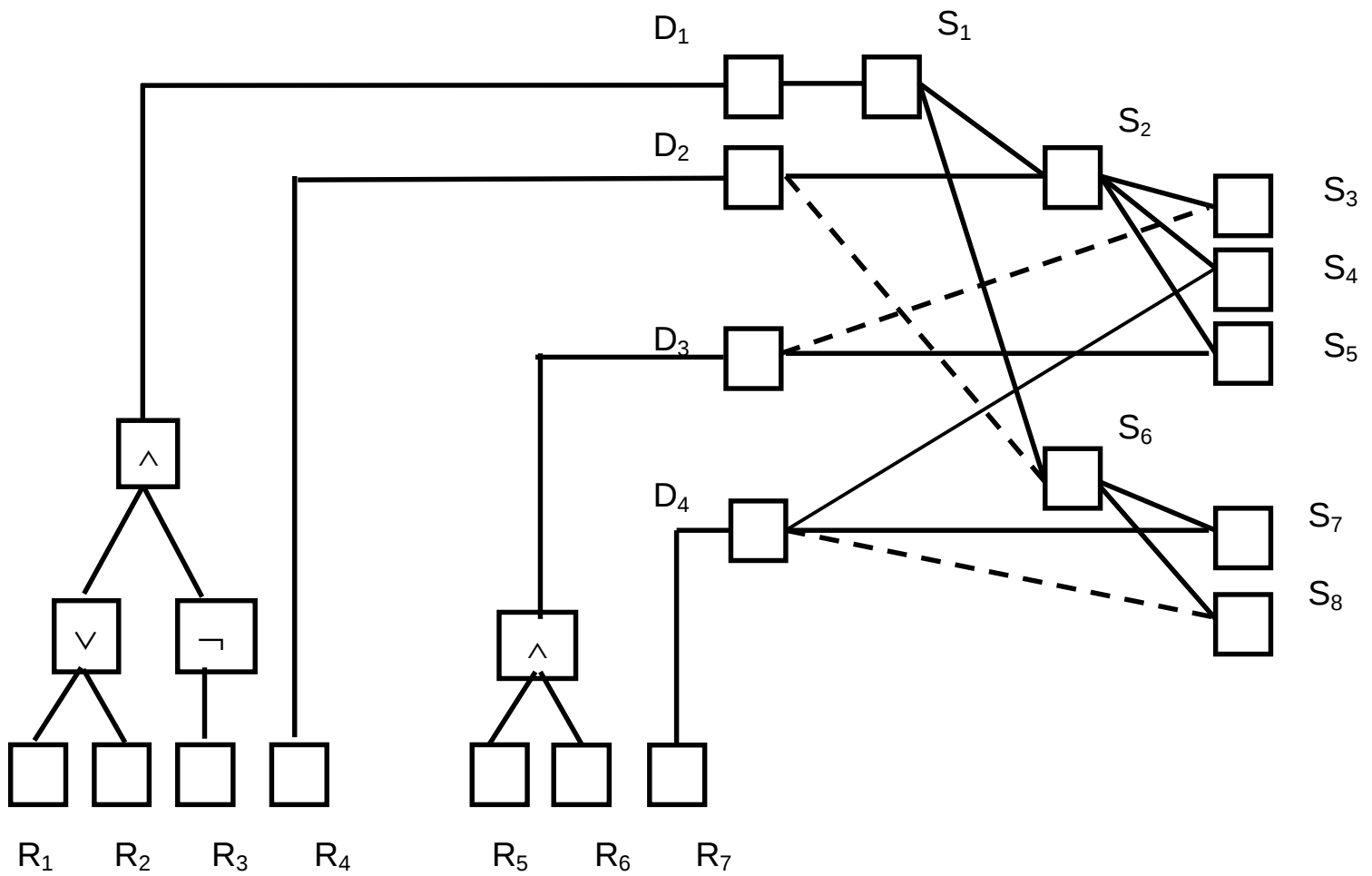


figure 1: classification scheme

Exercise 4: Garden Design (configuration)

Designing a garden is a tough task. A garden has a structure of paths and flowerbeds between. In the flowerbeds plants and shrubs must be placed, to generate plenty of colour throughout the year. A catalogue is available that helps to select plants, given the type of garden, the type of soil, the desired colour and shade conditions

- a. Show that designing a garden can be seen as a configuration task. Use a drawing to indicate how the specification and the configuration spaces are filled in, with all the necessary knowledge models.

In practice, garden design proceeds in a number of steps. In between steps, no back-tracking is needed. It is possible to look one step ahead.

- step 1. Determine the boundaries of the garden (house, fence), the most important areas (terrace, shed) and the walking routes in between.
- step 2. Design the paths, using the walking routes. The spaces in between the paths become flowerbeds. Place all large objects (trees, pond).
- step 3. Select material for the paths and terrace (tiles, grass). Determine the type of each flowerbed (Japanese, rock garden)
- step 4. Select for each flowerbed those plants from the catalogue, which suit the type of garden, the soil and the shade conditions.

- b. Is this configuration method an instance of MCF1, MCF2 or MCF3? Why?

Exercise 5: Diagnosis

In determining the most useful observation or test (*probe selection*) for giving a diagnosis, one can make use of the expected information value of the answer. However, there are other aspects involved.

- a. Name three other factors that influence the choice of diagnostic test.

Consider the following electronic circuit, consisting of two multipliers (M1 and M2), two adders (A1 and A2) and a couple of connections. Contrary to expectations, the result at T1 is 0. We try to find the causes of this defect, using *backward simulation*. Assume that input values are non-negative (≥ 0).

- b. Indicate for each of the testing points (T1 - T4) the possible results, with the corresponding assumptions about which components do or do not function correctly.

