GWV – Grundlagen der Wissensverarbeitung

Tutorial 7 : Propositions and Inference

Exercise 1.1 : (CSI Stellingen)

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Introduction to Diagnosis: A Murder Investigation

Apply your knowledge of propositions and inference to catch the murderer. Find a formal representation of the assumables, observations, rules and integrity constraints given below. Then compute the minimal conflict and the minimal diagnosis for the following scenario:

A millionaire has been found murdered in his villa. Both the butler and the gardener are possible suspects.

- Assumables: Your assumables are the statements by the different suspects.
  - Gardener: I have been working in the garden all day. (And thus was not able to commit the murder.)
  - Butler: I have been fixing the car in the garage all day. (And thus was not able to commit the murder.)
- Observations: Your observations are facts that you have observed during your investigation.
  - The gardener has no dirt on his hands.
  - The butler has dirt on his hands.
- Rules: Now you can use rules to deduce new facts from both your observations and the statements given by the suspects.
  - If the gardener worked in the garden all day, he will have dirt on his hands.
  - If the butler worked in the garage all day, he will have dirt on his hands.
- Integrity Constraints: Finally you can apply integrity constraints to find out which of the statements must be false.
  - The gardener has either dirt on his hands or he has no dirt on his hands.
  - The butler has either dirt on his hands or he has no dirt on his hands.

Exercise 1.2 : (Diagnosis)

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Figure 1 shows a diagram of an engine in a car. When the ignition key is turned a good mechanic can hear (observe) three noises produced by the starter, the fuel pump and the engine itself. In case one of the noises is not observed there is a fault in at least one component. Formalize the given diagnosis problem. You can assume that all connections

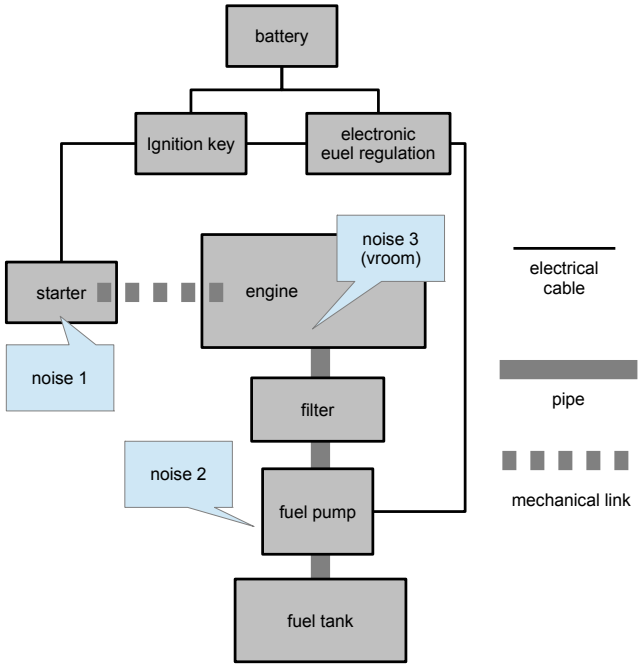

Figure 1: A car engine

(cables, pipes and mechanical links) work properly but each component (grey box) could be faulty in one way or the other: A fuel tank could be empty, a starter broken, a filter clogged and so on.

Perform a diagnosis (that is compute the minimal diagnosis) for the following sets of observations:

- No noises
- Only noise 1
- Only noise 2
- Noise 1 and 2 but not noise 3

You can *either* do the formalization and diagnosis on paper *or* you can make an implementation in Prolog.

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