

GWV - Grundlagen der Wissensverarbeitung

Tutorial 7

Julian Tobergte, Melanie Budde,
Maximilian Bauregger, Mohammad Oslani

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Exercise 7.1 Diagnosis

Assumable:

battery, ignition, efr, starter, engine, fuel_pump, filter, fuel_tank

Rules:

```
1 false ← !noise1
2 false ← !noise2
3 false ← !noise3
4 noise3 ← engine
5 noise2 ← fuel_pump
6 noise1 ← starter
7 engine ← starter ^ filter ^ fuel_pump ^ fuel_tank
8 fuel_pump ← efr
9 starter ← ignition
a efr ← ignition ^ battery
b ignition ← battery
```

Integrity Constraints:

```
for el in Assumable, noise1, noise2, noise3:
false ← el ^ !el
```

Observation1:

```
!noise1, !noise2, !noise3
```

```
false← !noise1 ^ !noise2 ^ !noise3 | 6, 5, 4
```

$\text{!starter} \wedge \text{!fuel_pump} \wedge \text{!engine} \mid 9, 8, 7$
 $\text{!ignition} \wedge \text{!efr} \wedge \text{!(starter} \wedge \text{filter} \wedge \text{fuel_pump} \wedge \text{fuel_tank)} \mid \text{deMorgan}$
 $\text{!ignition} \wedge \text{!efr} \wedge (\text{!starter} \vee \text{!filter} \vee \text{!fuel_pump} \vee \text{!fuel_tank}) \mid \text{redundancy (starter}$
 $\leftarrow \text{ignition})$
 $\text{!ignition} \wedge \text{!efr} \mid b, a, b$
 !battery

{battery} ist ein Konflikt und per Definition auch ein minimaler Konflikt.

Weitere Konflikte:

{ignition, efr}, {starter, fuel_pump, engine}, {starter, fuel_pump}.

Die minimale Diagnose ist {battery, ignition, starter, fuel_pump}.

Observation2:

noise1, !noise2, !noise3

$\text{false} \leftarrow \text{!noise2} \wedge \text{!noise3} \mid 5, 4$
 $\text{!fuel_pump} \wedge \text{!engine} \mid 8$
 $\text{!efr} \wedge \text{!engine} \mid 7$
 $\text{!efr} \wedge \text{!starter} \vee \text{!filter} \vee \text{!fuel_pump} \vee \text{!fuel_tank} \mid$
 starter muss gelten wg noise1
 $\text{!efr} \wedge \text{!filter} \vee \text{!fuel_pump} \vee \text{!fuel_tank} \mid 8$
 $\text{!efr} \wedge \text{!filter} \vee \text{!efr} \vee \text{!fuel_tank} \mid$

Konflikte:

{efr}, {efr, filter}, {efr, fuel_tank},
 {efr, fuel_pump}, {efr, engine}, {efr, filter, fuel_tank}
 minimale Diagnose: {efr}

Observation3:

!noise1, noise2, !noise3

$\text{false} \leftarrow \text{!noise1} \wedge \text{!noise3} \mid 6, 4$
 $\text{!starter} \wedge \text{!engine} \mid 9$ darf nicht angewendet werden wegen noise2,7
 $\text{!starter} \wedge \text{!starter} \vee \text{!filter} \vee \text{!fuel_pump} \vee \text{!fuel_tank} \mid 5$
 $\text{!starter} \wedge \text{!starter} \vee \text{!filter} \vee \text{!fuel_tank} \mid 9$
 $\text{!starter} \wedge \text{!filter} \vee \text{!fuel_tank} \mid b$
 $\text{!starter} \wedge \text{!filter} \vee \text{!fuel_tank}$

Konflikte:

{starter, filter} , {starter, fuel_tank}, {starter, filter, fuel_tank}

Minimale Diagnose:

{starter}

Observation4:

noise1, noise2, !noise3

false \leftarrow !noise3 | 4, 7

!(starter \wedge filter \wedge fuel_pump \wedge fuel_tank) | deMorgan

!starter \vee !filter \vee !fuel_pump \vee !fuel_tank | wg. noise1 muss starter angenommen werden

!filter \vee !fuel_pump \vee !fuel_tank | analog für noise2 und fuel_pump

!filter \vee !fuel_tank

Keine weitere Ableitung möglich, daher als Konflikte {filter} und {fuel_tank}, sowie Vereinigungen dieser Mengen mit weiteren Assumables.

Die triviale minimale Diagnose ist {filter, fuel_tank}.

Exercise 7.2 CSI Stellingen

Assumable

gardener_worked_all_day
butler_worked_all_day

Observations

\neg *gardener_dirty*
butler_dirty

Rules

gardener_dirty \leftarrow *gardener_worked_all_day*
butler_dirty \leftarrow *butler_worked_all_day*

Integrity Constraints

false \leftarrow *gardener_dirty* \wedge \neg *gardener_dirty*
false \leftarrow *butler_dirty* \wedge \neg *butler_dirty*

$$KB = \left\{ \begin{array}{l} \textit{false} \leftarrow \textit{gardener_dirty} \wedge \neg \textit{gardener_dirty} \\ \textit{false} \leftarrow \textit{butler_dirty} \wedge \neg \textit{butler_dirty} \\ \textit{gardener_dirty} \leftarrow \textit{gardener_worked_all_day} \\ \textit{butler_dirty} \leftarrow \textit{butler_worked_all_day} \\ \neg \textit{gardener_dirty} \\ \textit{butler_dirty} \end{array} \right\} \quad (1)$$

Minimal conflicts

$\{\textit{gardener_worked_all_day}\}$

Minimal diagnosis

$\{\textit{gardener_worked_all_day}\}$

Die Aussage des Gärtners, er habe den ganzen Tag gearbeitet, kann nicht stimmen.
Daher ist er der Mörder.

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