Exercise Sheet WS 13/14
Wirtschaftsinformatik und Maschinelles Lernen (ISMLL)
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Exercise Sheet 7

Submission: Monday, 06.01.2014, 23:00

Exercise 1 Propositional Logic (20 Points)

a) Write the truth tables of :

- $\neg A \vee B$
- $A \Rightarrow B$
- $(\neg A) \Leftrightarrow B$
- $A \wedge (B \vee C)$
- $A \vee (B \wedge \neg\, C)$
- $A \Rightarrow (\neg B \wedge C)$

(3 Points)

b) What means that a sentence is:

- a tautology or
- a contradiction or
- satisfiable?

Demonstrate which characteristics have this formulas with transformations or truth tables. Explain all your steps.

(a) $\neg((A \Rightarrow (B \Rightarrow C)) \vee (A \vee B \vee \neg C))$
(b) $\neg(((A \wedge \neg B) \vee C) \vee ((A \Rightarrow B) \Rightarrow C))$

(7 Points)

c) Transform the next formula in CNF and demonstrate with a proof as in (b) if it is a tautology, a contradiction or satisfiable.

- $\neg((A \Rightarrow (B \Rightarrow \neg C)) \vee (A \vee (B \wedge \neg C)))$

Transform the current formula in DNF and decide with the exercise in (b) if it is a tautology, a contradiction or if it is satisfiable:

- $(((A \vee \neg B) \wedge C) \vee ((\neg A \Rightarrow B) \Rightarrow C))$

(4 Points)

d) Decide whether the following formula if it is a Horn Form or a Horn clause. Motivate your decision.

- $(\neg U \vee W) \wedge (U \vee \neg V) \wedge (X \vee \neg U \vee \neg W) \wedge X \wedge (\neg W \vee \neg V)$
- $W \wedge U \wedge V \wedge \neg X$
- $W \vee U \vee V \vee \neg X$
- $(\neg U \vee W) \wedge (U \vee \neg V) \wedge (X \vee U \vee \neg W) \wedge X \wedge (\neg W \vee \neg V)$
- $\neg W \vee \neg U \vee \neg V \vee \neg X$
- $\neg W \vee U \vee \neg V \vee \neg X$

(3 Points)

e) Why is it important to have Horn-clauses with one positives literal?
(3 Points)