COS402- Artificial Intelligence
Fall 2015

Lecture 5: Propositional Logic

Outline

- **Syntax and Semantics**
- **Entailment**
- **Model checking**
- **Concepts needed for theorem proving**
  - **Logical equivalence**
  - **Validity**
  - **Satisfiability**

Satisfiability and Validity

- A sentence is valid if it is true in all models.
- A sentence is satisfiable if it is true in some model.
- A sentence P is valid if and only if ¬P is unsatisfiable
- A valid sentence is always satisfiable

Satisfiable, unsatisfiable, or valid

1. **P**
2. **¬P**
3. **P ∨ ¬P**
4. **P ∧ ¬P**
5. **P ∨ Q**
6. **P ∧ Q**

Satisfiable, unsatisfiable, or valid

7. $P \Rightarrow Q$
8. $P \Leftrightarrow Q$
9. $(P \wedge Q) \Rightarrow P$
10. $(P \wedge Q) \Rightarrow \neg P$

Satisfiable, unsatisfiable, or valid

7. $P \Rightarrow Q$ $(Q \vee \neg P)$

8. $P \Leftrightarrow Q$ $((Q \vee \neg P) \wedge (P \vee \neg Q))$

9. $(P \wedge Q) \Rightarrow P$ $(P \vee \neg(P \wedge Q))$ --> $(P \vee \neg P \vee \neg Q)$

10. $(P \wedge Q) \Rightarrow \neg P$ $(\neg P \vee \neg(P \wedge Q))$ --> $(\neg P \vee \neg P \vee \neg Q)$

Announcement & Reminder

- **P1 (first programming assignment) has already been released. It is due on Tuesday Oct. 13th.**

  --- due by midnight, upload your files to CS dropbox

- **W1 is due on Tuesday Oct. 6th**

  --- Due in class, hard copies.