

The University of North Carolina at Chapel Hill

COMP 144 Programming Language Concepts
Spring 2002

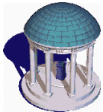
Lecture 26: Introduction to Logic Programming with Prolog

Felix Hernandez-Campos

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1



Logic Programming

- A logic program is a collection of axiom from which theorems can be proven
- A program is a theorem
 - The language tries to find a collection of axioms and inference steps that imply the goal
- Axiom are written in a standard form known as **Horn clauses**
 - A Horn clause consists of a *consequent* (head H) and a *body* (terms B_i)
 $H \leftarrow B_1, B_2, \dots, B_n$
 - Semantics: when all B_i are true, we can deduce that H is true

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2



Resolution

- Horn clauses can capture most logical statements
 - But not all
- The derivation of new statements is known as *resolution*
 - The logic programming system combines existing statements to find new statements
 - For instance,

$C \leftarrow A, B$

A and B imply C

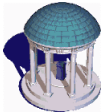
$D \leftarrow C$

$D \leftarrow A, B$

**If we know that A and B imply C,
and that C implies D,
then we can deduce that A and B imply D**

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3



Example

Variable
 $\text{flowery}(X) \leftarrow \text{rainy}(X)$ **Predicate Applied to a Variable**

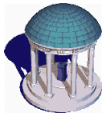
$\text{rainy}(\text{Rochester})$ **Predicate Applied to an Atom**

$\text{flowery}(\text{Rochester})$

**Free Variable X acquired value
Rochester during the resolution
This is known as *Unification***

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4

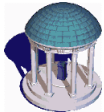


Prolog

- *PRO*gramming in *LOG*ic
- It is the most widely used logic programming language
- Its development started in 1970 and it was result of ta collaboration between researchers from Marseille, France, and Edinburgh, Scotland
- Main applications:
 - Artificial intelligence: expert systems, natural language processing, ...
 - Databases: query languages, data mining,...
 - Mathematics: theorem proving, symbolic packages,...

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5



Reading Assignment

- Read
 - Scott Ch. 11 intro
 - Scott Sect. 11.3 intro, 11.3.1

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6