Concepts of programming languages

Prolog

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Terms

- building blocks of facts, rules, and queries.
- 4 kinds of terms:
- atoms
- numbers (both are called constants)
- variables
- complex terms

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Atom

Either:

- ► string of charachrers (upper-case, lower-case, digits, _), begins with lower-case ch. E.g.: big_kahuna_burger, listens2Music.
- ► arbitraty string of characters enclosed in '' (single). E.g: 'The Beatles', ' &ˆ%&#@$ &* '.
- ► string of special characters (e.g. ; or :-) E.g: in rule syntax term1 :- term2;

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Numbers

- ► Floats (e.g. 1657.3087 or π)
- ► Integers (23 , 1001 , 0 , -365)
- ► Straigtforward syntax

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Variable

- starts with upper-case letter or _ (E.g: X, Y_50, List1, _input)
- anonimous variable _

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Complex term

- building block: functor (which is an atom) with arguments (terms) E.g: `playsAirGuitar(jody)`, `loves(vincent,mia).`
- nested functors make up complex terms E.g: `and(big(burger),kahuna(burger)).`, `vertical(line(point(X,Y),point(X,Z))).`

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Clauses

- Rules (clauses) state information that is conditionally true of the situation of interest.
- term1 :- term2
- term1 is true if term2 is true.

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some examples again

```
father(Y,Z):-  man(Y),  son(Z,Y).
wizard(X):-  hasBroom(X),  hasWand(X).
```

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Unification (how it works)

Two terms unify if they are the same term or if they contain variables that can be uniformly instantiated with terms in such a way that the resulting terms are equal.

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what this means??

…examples

more on unification..

- ► two terms either unify or not
- ► if they unify, we are interested to know how the variables have to be instantiated to make the terms unify.

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more precise rules:

Two terms (term1 and term2) unify:

- ▶ 1. If they are both constants, they unify iff they are the same atom (or number)
- ▶ 2. If term1 is a variable and term2 is any term, then they unify and term1 is instantiated to term2.
- ▶ 3. If both terms are variables, they're both instantiated to each other.
- ▶ 4. If both are complex terms and … (next silde)
- ▶ 5. Iff it follows from the rules above that they unify.

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Some examples first

Terms that unify (1) *burger_1* and *burger_1* (2) *X* and vincent (*X* is inst-ed to *vincent*) (3) *X* and *Y*

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For complex terms:

If term1 and term2 are complex terms, they unify iff:

- ► they have the same functor and arity (nr. of args)
- ► all their corresponding arguments unify
- ► the variable instantiations are compatible

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Compex term example:

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Extented example with queries