

Concepts of programming languages

Prolog

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Proof Search

- ▶ The manner in which a query is handled
- ▶ Knowledge Database is read from top to bottom
- ▶ Tries to unify with facts and heads of rules
- ▶ At first valid encounter, unification is carried out
- ▶ Variables are replaced by internal variables (e.g. _G2145)
- ▶ A search is done in a depth first fashion in a tree-shaped structure



A simple example (1)

Knowledge database:

```
u(a) .  
u(b) .  
v(a) .  
v(b) .  
w(b) .  
z(X) :- u(X) , v(X) , w(X) .
```

Figure 1: Knowledge database



A more complicated example (1)

Knowledge database:

```
loves(henk, maria).  
loves(theo, maria).  
jealous(X, Y) :- loves(X, Z), loves(Y, Z).
```

Figure 2: Knowledge database



A more complicated example (3)

- ▶ Results not always as expected
- ▶ `jealous(X,Y)`:

```
3 ?- jealous(X,Y)
X = Y, Y = henk ;
X = henk,
Y = theo ;
X = theo,
Y = henk ;
X = Y, Y = theo.
```

Figure 3: `jealous(X,Y)`

- ▶ `jealous(X,X)`

```
1 ?- jealous(X,X)
|
X = henk ;
X = theo.
```



Powerful basis for logical inference

- ▶ Combining unification and backtracking to search trees results in a fast tool for logical inference
- ▶ Understanding of underlying concepts is important to understand results produced
- ▶ Various implementations might grant different results, when considering a query like:

?- father(X) = X





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