

A Brief Introduction to Datalog

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ACM11

July 25, 2012

What is Datalog?

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to Datalog

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- ① A Subset of Prolog
- ② A Query and Rule Language for Deductive Databases
- ③ logic programming
- ④ Datalog is used in data integration, information extraction, etc.

Constants

- 1, 1.2E+5
- foo, foo_bar
- 'foo bar'

Variables

- X, Y
- _X, _var
-

Unknowns **null**

Atoms

Atoms has the form $\mathbf{a}(\mathbf{t}_1, \mathbf{t}_2, \dots, \mathbf{t}_n)$

\mathbf{a} is a relation symbol

\mathbf{t}_i is a term

```
male(lilei).    female(hanmeimei).
```

```
love(lilei,hanmeimei).  love(hanmeimei,lilei).
```

```
employee(null,sales,1200).
```

```
X is 1+2.
```

Rules

Rules have the form **Head**
or the form **Head** : -**Body**, which equal to **Body** \Rightarrow **Head**.

```
love(lilei, hanmeimei).  
love(hanmeimei, lilei).  
love(lintao, hanmeimei).
```

```
lover(X,Y) :- love(X,Y), love(Y,X).
```

```
oneside(X,Y) :- love(X,Y), not(love(Y,X)).
```

```
rival(X,Y) :-  
love(X,Z), (love(Z,Y); love(Y,Z)), not(X=Y).
```

A program consists of many rules

Queries

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```
DES> lover(lilei ,X)
{
  lover(lilei ,hanmeimei)
}
Info: 1 tuple computed.
```

```
DES> onese(X,Y)
{
  onese(lintao ,hanmeimei)
}
Info: 1 tuple computed.
```

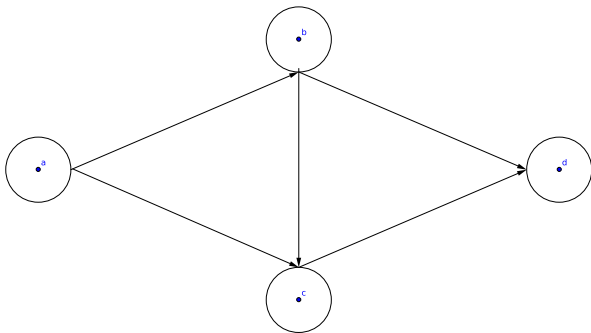
```
DES> rival(X,Y)
{
  rival(lilei , lintao ),
  rival(lintao , lilei )
}
Info: 2 tuples computed.
```

I'm evil... 

Another Example—Shortest Path

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edge(a, b).

edge(b, d).

edge(a, c).

edge(c, d).

edge(b, c).


```
path(X,Y,1) :-  
    edge(X,Y).
```

```
path(X,Y,L) :-  
    path(X,Z,L0),  
    edge(Z,Y),  
    count(edge(A,B),Max),  
    L0 < Max,  
    L is L0+1.
```

```
spaths(X,Y,L) :-  
    min(path(X,Y,Z),Z,L).
```

```
DES> spaths(X,Y,L)
```

```
{
```

```
  spaths(a,b,1),
```

```
  spaths(a,c,1),
```

```
  spaths(a,d,2),
```

```
  spaths(b,c,1),
```

```
  spaths(b,d,1),
```

```
  spaths(c,d,1)
```

```
}
```

```
Info: 6 tuples computed.
```

Another Example—Fibonacci Numbers

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```
fib(0,1).
```

```
fib(1,1).
```

```
fib(N,F) :-
```

```
  N>1,
```

```
  N2 is N-2,
```

```
  fib(N2,F2),
```

```
  N1 is N-1,
```

```
  fib(N1,F1),
```

```
  F is F2+F1.
```

```
DES> fib(100,F)
{
  fib(100,573147844013817084101)
}
Info: 1 tuple computed.
```

```
DES> fib(500,F)
{
  fib(500,2255915161619363308725126950360
720720460113249137581905886388664184746
27738686883405015987052796968498626)
}
Info: 1 tuple computed.
```

BigIntger?Memorized Search?

It's convenient to operate on sets

```
a(a1).
```

```
a(a2).
```

```
a(a3).
```

```
b(b1).
```

```
b(b2).
```

```
b(a1).
```

```
union(X) :- a(X) ; b(X).
```

```
difference(X) :- a(X), not(b(X)).
```

```
cartesian(X,Y) :- a(X), b(Y).
```

Feelings

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The Datalog language is not a simple one. Only when we have learnt *Set Theory and Mathematical Logic* can we have a better understanding on it.



Reference

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[Fernando Senz Prez](#)

Datalog Educational System V3.0 Users Manual



[Marcelo Arenas](#)

Datalog as a Query Language for Data Exchange Systems



[Wikipedia](#)



[StackOverFlow](#)

Thank you!

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