



Rule-Based Systems II: Logic Programming

Reasoning Example: first try

parent(peter, paul). (F1)

parent(paul, mary). (F2)

ancestor(X, Y) :- ancestor(X, Z), parent(Z, Y). (R1)

ancestor(A, B) :- parent(A, B). (R2)

?- ancestor(peter, paul)

?- ancestor(peter, mary)

?- ancestor(peter, carl)

Reasoning Example: infinite loop with Q1

?- ancestor(peter, paul)


L = {ancestor(peter, paul)}

R1: L = {ancestor(peter, Z1), parent(Z1, paul)}

R1: L = {ancestor(peter, Z2), parent(Z2, Z1),
parent(Z1, paul)}

R1: L = {ancestor(peter, Z3),
parent(Z3, Z2),
parent(Z2, Z1),
parent(Z1, paul)}



 Infinite loop;
not expected answer („true“)

Reasoning Example: next try

parent(peter, paul). (F1)

parent(paul, mary). (F2)

ancestor(A, B) :- parent(A, B). (R1)

ancestor(X, Z) :- ancestor(X, Y), parent(Y, Z). (R2)

?- ancestor(peter, paul)

?- ancestor(peter, mary)

?- ancestor(peter, carl)

Reasoning Example (next try): Q1 works

?- ancestor(peter, paul)

L = {ancestor(peter, paul)}

R1: L = {parent(peter, paul)}

F1: L = {}

Reasoning Example (next try): Q2 works too

?- ancestor(peter, mary)

L = {ancestor(peter, mary)}

R1: L = {parent(peter, mary)} **FAIL**

R2: L = {ancestor(peter, Z1), parent(Z1, mary)}

R1: L = {parent(peter, Z1), parent(Z1, mary)}

F1{Z1/paul}: L = {parent(paul, mary)}

F2: L = {}

Reasoning Example (next try): Q3 ends up in infinite loop

?- ancestor(peter, carl)

L = {ancestor(peter, carl)}

R1: L = {parent(peter, carl)} **FAIL**

R2: L = {ancestor(peter, Z1), parent(Z1, carl)}

R1: L = {parent(peter, Z1), parent(Z1, carl)}

F1{Z1/paul}: L = {parent(paul, carl)} **FAIL**


R2: L = {ancestor(peter, Z2), parent(Z2, Z1),
parent(Z1, carl)}

R1: L = {parent(peter, Z2), parent(Z2, Z1),
parent(Z1, carl)}

F1{Z2/paul}: L = {parent(paul, Z1),
parent(Z1, carl)} **FAIL**

R2: L = {ancestor(peter, Z3), parent(Z3, Z2),
parent(Z2, Z1), parent(Z1, carl)}



 Infinite Loop;
not expected answer („false“)!

Reasoning Example (final try)

parent(peter, paul). (F1)

parent(paul, mary). (F2)

ancestor(A, B) :- parent(A, B). (R1)

ancestor(X, Y) :- parent(X, Z), ancestor(Z, Y). (R2)

?- ancestor(peter, paul)

?- ancestor(peter, mary)

?- ancestor(peter, carl)

Reasoning Example (final try): Q1 works

?- ancestor(peter, paul)

L = {ancestor(peter, paul)}

R1: L = {parent(peter, paul)}

F1: L = {}

Reasoning Example (final try): Q2 works too

?- ancestor(peter, mary)

L = {ancestor(peter, mary)}

R1: L = {parent(peter, mary)} **FAIL**

R2: L = {parent(peter, Z1), ancestor(Z1, mary)}

F1{Z1/paul}: L = {ancestor(paul, mary)}

R1: L = {parent(paul, mary)}

F2: L = {}

Reasoning Example (3/3): Q3 also works!!

?- ancestor(peter, carl)

L = {ancestor(peter, carl)}

R1: L = {parent(peter, carl)} **FAIL**

R2: L = {parent(peter, Z1), ancestor(Z1, carl)}

F1{Z1/paul}: L = {ancestor(paul, carl)}

R1: L = {parent(paul, carl)} **FAIL**

R2: L = {parent(paul, Z2), ancestor(Z2, carl)}

F2{Z2/mary}: L = {ancestor(mary, carl)}

R1: L = {parent(mary, carl)} **FAIL**

R2: L = {parent(mary, Z3),
ancestor(Z3, carl)} **FAIL**

FAIL