Alex Stewart

CS350 HW10

Enhanced Data Models and Advanced Applications (DUE Week 11 - Friday night at midnight)

26.44

Consider the following rules:

Rule 1: REACHABLE (X, Y) = - FLIGHT (X, Y)

Rule 2: REACHABLE (X, Y) = - FLIGHT (X, Z) and REACHABLE (Z, Y)

REACHABLE (X,Y) = city Y can be reached from city X

FLIGHT (X,Y): = a flight is present from city Y to city X

A.

Construct fact predicates that describe the following:

1. Los Angeles, New York, Chicago, Atlanta, Frankfurt, Paris, Singapore, Sydney are the cities.
2. The following existing flights = LA to NY, NY to Atlanta, Atlanta to Frankfurt, Frankfurt to Atlanta, Frankfurt to Singapore, and Singapore to Sydney.

REACHABLE(NY,ATL) = - FLIGHT(NY,ATL)

REACHABLE(LA,NY) = - FLIGHT(LA,NY)

REACHABLE(FF,ATL) = - FLIGHT(FF,ATL)

REACHABLE(ATL,FF) = - FLIGHT(ATL,FF)

REACHABLE(FF,SI) = - FLIGHT(FF,SI)

REACHABLE(SI,SY) = - FLIGHT(SI,SY)

B.

Is the given data cyclic? If so, in what sense?

According the the second rule all locations can reach on another, however you can't assume flight goes in reverse.Atlanta and Frankfurt form a binary cycle, which means the data cannot be considered as cyclic.

C.

Construct a model-theoretic interpretation (that is, an interpretation similar to the one shown in Figure 26.13) of the above facts and rules.

Rules:

REACHABLE(X, Y) = - FLIGHT(X, Y)

REACHABLE(X, Y) = - FLIGHT(X, Z), REACHABLE(Z, Y)

Known Facts:

REACHABLE(LA,NY) = true

REACHABLE(NY,ATL) = true

REACHABLE(ATL,FF) = true

REACHABLE(FF,ATL) = true

REACHABLE(FF,SI) = true

REACHABLE(SI,SY) = true

Derived Facts:

REACHABLE(LA,SI) = true

REACHABLE(LA,SY) = true

REACHABLE(NY,FF) = true

REACHABLE(NY,SI) = true

REACHABLE(NY,SY) = true

REACHABLE(ATL,SI) = true

REACHABLE(ATL,SY) = true

REACHABLE(LA,ATL) = true

REACHABLE(LA,FF) = true

D.

Consider the query REACHABLE(Atlanta, Sydney)?

How will this query be executed? List the series of steps it will go through.

Step 1 REACHABLE(X, Y) = - FLIGHT(X, Y) - Rule 1

Step 2 REACHABLE(X, Y) = - FLIGHT(X, Z), REACHABLE(Z, Y) - Rule 2

Step 3 REACHABLE(ATL,FF) - Given

Step 4 REACHABLE(FF,SI) - Given

Step 5 REACHABLE(SI,SY) - Given

Step 6 REACHABLE(ATL,SI) - rules 2, 3 and 4

Step 7 REACHABLE(ATL,SY) -rules 2, 5 and 6

E.

Consider the following rule-defined predicates:

ROUND-TRIP-REACHABLE(X, Y) = -REACHABLE(X, Y), REACHABLE(Y, X),

DURATION(X, Y, Z)

Draw a predicate dependency graph for the above predicates. (Note:

DURATION(X, Y, Z) means that you can take a flight from X to Y in Z

hours.)

Diagram On Last Page

F.

Consider the following query: What cities are reachable in 12 hours from

Atlanta? Show how to express it in Datalog. Assume built-in predicates

like greater-than(X, Y). Can this be converted into a relational algebra

statement in a straightforward way? Why or why not?

answer(Y) = -DURATION("Atlanta",Y,12)

Yes, it is easily converted

G.

Consider the predicate population(X, Y), where Y is the population of

city X. Consider the following query: List all possible bindings of the predicate pair (X, Y), where Y is a city that can be reached in two flights from city X, which has over 1 million people. Show this query in Datalog. Draw a corresponding query tree in relational algebraic terms.

temp(X)= - population(X,Y), Y > 1000000.

temp2(Z)= -REACHABLE(X,Y),REACHABLE(Y,Z).

answer(X,Y)= -REACHABLE(X,Z),temp(X),temp2(Z)

Diagram On Last Page

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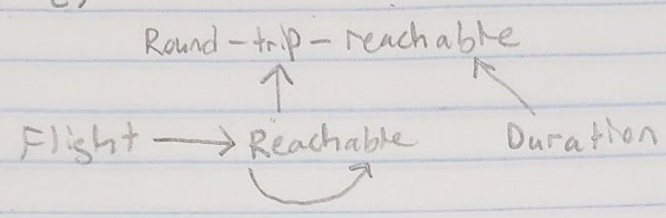
Part E.



Part G.